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Final EIS/EIR Las Virgenes-Triunfo Malibu-Topanga Area Wide Facilities Plan

Environmental Protection Agency, San Francisco, Calif Region IX

Sep 77

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Final EIS/EIR
Las Virgenes-Triunfo
Malibu-Topanga

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The purpose of the final Las Virgenes Municipal Water District (LVMWD) - Triunfo County Sanitation District (TCSD) Area Wide Facilities Project Plan Report is to define and analyze two specific elements of the proposed facilities plan for the LVMWD/TCSD area. These two elements are the Calabasas Reclaimed Water Line and improvements to the solids handling capability of LVMWD's Tapia Water Reclamation Facility (WRF). Various alternatives have been presented and preferred alternatives have been recommended for both projects.

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Las Virgenes-Triunfo
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Area Wide Facilities Plan

Prepared by:
United States Environmental
Protection Agency

Region IX
100 California Street
San Francisco, California 94111

With Technical Assistance by:

EDAW, Inc.
220 Newport Center Drive #20
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September, 1977

Responsible Official

Paul De Falco Jr.
Regional Administrator
Environmental Protection Agency
Region IX

September 30, 1977

TO ALL INTERESTED AGENCIES, PUBLIC GROUPS & CONCERNED INDIVIDUALS:

The following Final Environmental Impact Statement/Environmental Impact Report for the Las Virgenes/Triunfo/Malibu/Topanga Area Wide Facilities Plan is hereby submitted for your review and comment. This statement has been prepared in compliance with the National Environmental Policy Act of 1969 (P. L. 91-190), and implementing regulations promulgated by the Council on Environmental Quality and the Environmental Protection Agency, and the California Environmental Quality Act of 1970.

Comments should be sent to this office within thirty (30) days of the date of this letter. All comments received will be considered prior to the final Administrative Action taken by this office.

In reviewing the document we call your attention to the proposed projects and the mitigation of the identified impacts.

All interested parties are invited to express their views. Persons wishing to make comments may submit them to:

Environmental Protection Agency
Attention: W-1
Region IX
100 California Street
San Francisco, California 94111

The Final EIS may be reviewed at:

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Thousand Oaks, California 91360
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Please bring this notice to the attention of all persons who would be interested in this matter.

Sincerely,

Paul De Falco

Paul De Falco Jr.
Regional Administrator

/vc
attachment

SUMMARY

ENVIRONMENTAL IMPACT STATEMENT

DRAFT ( )
FINAL (X)

Prepared by: United States Environmental Protection Agency
Pacific Southwest Region IX
San Francisco, California 94111

Type of Action: Administrative

DESCRIPTION OF PROJECT:

The purpose of the final Las Virgenes Municipal Water District (LVMWD)-Triunfo County Sanitation District (TCSD) Area Wide Facilities Project Plan Report is to define and analyze two specific elements of the proposed facilities plan for the LVMWD/TCSD area. These two elements are the Calabasas Reclaimed Water Line and improvements to the solids handling capability of LVMWD's Tapia Water Reclamation Facility (WRF). Various alternatives have been presented and preferred alternatives have been recommended for both projects.

A draft addendum EIS/EIR will be prepared to further analyze other issues which were included in the draft LVMWD/TCSD Area Wide Facilities Plan. These include:

- o Effluent disposal of the Tapia facility
- o Future wastewater management options for Las Virgenes and Triunfo
- o Future wastewater management for the Malibu and Topanga areas

AREA AFFECTED:

This Environmental Impact Statement (EIS) studies two primary areas in a regional context. The two primary areas are the Las Virgenes Municipal Water District service area and the Triunfo County Sanitation District service area.

The Las Virgenes Municipal Water District encompasses areas in the western portion of Los Angeles County to the Ventura County line, including: portions of the city of Los Angeles and Hidden Hills; and unincorporated communities of Agoura, Calabasas, Monte

Nido, Lake Lindero, Westlake Village, and Lake Manor. The portion of the Triunfo County Sanitation District in the study area is primarily the Malibu Creek watershed area in Ventura County.

There are two major areas of environmental concern: the natural environment, and the socio-cultural environment. The study area has many widely varied characteristics in both these areas. In the natural environment category, these characteristics include: the primarily rural, undeveloped land with scattered, intensely developed areas; its critical physical location with respect to air quality of the air basin; its steep slopes and geologic conditions which have precluded development in many large sectors; the prevelance of intermittent streams within the Malibu hydrographic unit; soil conditions consisting mainly of clayey soils and fine grained sedimentary rocks (typically shallow, expansion, with limited permeability); diversified biotic communities, some of which could be destroyed as development increases; and an abundance of scenic features including mountains, valleys, vegetation, bodies of water, and beautiful panoramas.

The socio-cultural characteristics include: study area population of approximately 38,400 (projected to increase to approximately 85,800 by the year 2000); large areas of open space, with residential use the primary land use in the urban areas (minimal commercial and industrial land uses); significant numbers of community, neighborhood, state and regional parks; numerous archaeological sites; heavy reliance on private automobile use for transportation; and predominantly low noise levels.

PROBLEM DESCRIPTION:

There are two definitive problem areas which are to be addressed by the proposed projects:

1. Effluent Disposal as related to the Calabasas Reclaimed Water Line.

   The present effluent disposal system utilized by LVMWD/TCSD consists of the sale of reclaimed water to private customers for spray irrigation of agricultural crops, as well as waste spray and disposal by percolation/seepage pits and wintertime discharge to Malibu Creek. This system has been a problem because of its major reliance on the sale of reclaimed water to customers which are accomplished only through limited agreements. Furthermore, there are few land areas suitable for this to occur due to constraints of soil and geologic, topographic suitability. Some of the land presently being utilized is being lost due to acquisition of this land for State Park purposes which will preclude spray irrigation. Other land is also subject to change in ownership and change in land use from agriculture to urban development. These changes are beyond the control of LVMWD/TCSD and it is the intent of the Calabasas Reclaimed Water Line project to permit other land areas to be utilized for spray irrigation of the reclaimed water. An additional objective is to substitute the use of domestic water for spray irrigation of a golf course to spraying with reclaimed water. Other long-term solutions of the effluent disposal problem are to be studied in a draft addendum.

2. Sewage Solids Handling at Tapia Water Reclamation Facility.

Tapia WRF has a design capacity of 8 million gallons per day (mgd), but is limited to approximately 4 mgd since its solids handling portion and some other minor facilities were constructed for only 4 mgd. At the present time, flow at the facility exceeds 4 mgd and the area which the reclamation facility is presently serving is undergoing rapid residential development. This has caused concern over the ability of the LVMWD and TCSD to effectively treat anticipated additional flows. Additionally, the present sludge disposal occurs on private land and a fee is charged to LVMWD/TCSD for this acceptance of sludge. Due to the possibility of change in land ownership and change in land use, this practice cannot be considered a long-term solution. The proposed project is to provide a long-term disposal method and permit the Tapia WRF to be utilized to its full design capacity.

ALTERNATIVES:

For the Calabasas Reclaimed Water Line, four alternative routes from the Tapia plant to the Calabasas Golf Course were considered. These involve a number of variations in route alignment from the existing storage reservoir at the LVMWD headquarters to a golf course located approximately 3-1/2 miles east.

Solids handling treatment systems and disposal alternatives were considered. The solids handling alternatives considered were:

1. Pumping of sludge to Sampo-Hope property.
2. Trucking of sludge to Sampo-Hope property.
3. Pumping of sludge to Ross property.
4. Trucking of sludge to Ross property.
5. Trucking of sludge to Calabasas landfill.

Disposal alternatives include:

1. Trucking to Calabasas landfill.
2. Sludge injection process at Ross property.
3. Sod/forage crop at Sampo-Hope property.

THE EIS PROCESS:

Preparation of an EIS on this project is required by several of the criteria stated in EPA's April 14, 1975, Final Regulations for the Preparation of Environmental Impact Statements. Basically, an EIS is required because the project is expected to have signigicant effects on the human environment, particularly water quality, land use, and air quality. Furthermore, the nature and value of these effects is at issue within the project area.

The purpose of this statement is to publicly present all issues surrounding the project's objectives, including primary and secondary effects, so that they can be resolved as openly and satisfactorily as possible. In keeping with this open policy, the EIS has been developed as part of a decision process to select the most desirable reclaimed waterline alternative and solids handling system capacity in accordance with local, state and federal objectives.

Following publication of the Final EIS, there will be a 30-day public comment period for the alternatives presented in the Final EIS. At the end of the 30-day comment period, EPA will then decide whether or not to fund the project as described in the Final EIS.

IMPACTS OF PREFERRED ALTERNATIVES:

All proposed alternatives to both projects would involve construction and its associated environmental impacts. Construction would occur at the treatment plant site, along Las Virgenes Canyon Road, and at the sludge farms. Construction impacts would most significantly involve noise, dust, traffic disruption, disturbance of biotic communities, and disruption of archaeological sites. These impacts can all be minimized with appropriate mitigation measures.

Operation impacts would consist of increased energy usage; commitment of land for use in pipeline easements and sludge farming; and visual disruption of rural areas due to presence of sludge holding tanks and diversion channels. These operation impacts can be minimized/reduced through appropriate mitigation measures and continued monitoring of all aspects of the project.

Secondary impacts which could occur in the study area as a result of growth, not necessarily as a result of this project, are: changes in land use; increased traffic congestion; continuing aggravation of the air quality problem in the South Coast Air Basin; and increased demand for public services. Currently, LVMWD is seeking to obtain commitments from affected agencies/governmental bodies involved in implementing mitigation measures for these secondary impacts.

MITIGATION OF SECONDARY IMPACTS:

As a condition of receiving grant funds, LVMWD/TCSD were requested by EPA to secure commitments from the appropriate governmental bodies/agencies measures which would mitigate impacts to air quality. Principally, the EPA is concerned with secondary air quality impacts as mandated by the Clean Air Act and its amendments (PL 95-95 and HR 6161). Since the completion of the Draft EIS, LVMWD, as administrative lead of the joint powers, has been in contact with the local agencies empowered to adopt mitigation measures relative to air quality impacts as related to the population which would be accommodated by the proposed project. Agencies contacted by the LVMWD are:

1. State of California Air Resources Board
2. L. A. County Regional Planning Commission
3. Ventura County Public Works Agency
4. Ventura County Air Pollution Control District
5. Ventura County Environmental Resources Agency
6. Ventura County Environmental Services Department
7. City of Hidden Hills

This effort has resulted in the following actions:

1. LVMWD resolution 7-77-921 by the Board of Directors obligating the district to participate and implement an AQMP within their statutory authority.

2. City of Hidden Hills resolution 236 by the City Council obligating the City to participate and implement an AQMP within their statutory authority.

3. Ventura County Board of Supervisors resolution 17/425.100 obligating the County to participate and implement the Ventura County AQMP within their statutory authority.

4. Triunfo County Sanitation District resolution 425.100 obligating the TCSD to participate and implement an AQMD within their statutory authority.

The above resolutions are contained within Appendix J.

The Southern California Association of Governments responded to the LVMWD staff request for a SCAG Executive Board resolution by indicating that SCAG, as the lead agency involved in the comprehensive wastewater management planning section of the Clean Water Act (Section 208), is currently developing policy guidelines for mitigation of impacts as related to wastewater treatment plants constructed with funds provided for in the Clean Water Act, Section 201. Upon adoption of these policy guidelines, they will apply to the LVMWD/TCSD project.

EPA DECISION AND RATIONALE:

As discussed in Chapter 3 of this EIS, the proposed project will alleviate the existing solids handling deficiencies and will provide for an increase in the use of reclaimed effluent from the Tapia WRF. The primary project construction and operation impacts will be reduced to minor levels by the mitigation measures contained in this report, and further development of the mitigation measures during the preparation of plans and specifications.

As discussed in Chapter 5, the principal secondary impacts related to the proposed projects are continuation of the severe air quality condition, land use change, increased traffic, and noise.

EPA believes that LVMWD/TCSD have shown good faith in their efforts to mitigate the impacts relative to the increased population accommodated by the project. However, due to the status of ongoing AQMP efforts in the study area, additional elements for an acceptable mitigation program will be developed as the various planning efforts progress.

The full utilization of the Tapia WRF capacity resulting from implementation of the solids handling elements of the proposed action is constrained by two factors:

1. The solids handling project will not be completed and in operation for an estimated 3 years.

2. A means of disposing the greater quantities of effluent has not been determined. Any proposed solution to this issue is subject to a draft Addendum EIS and subsequent Final EIS, as required and announced in the EPA notice of May 13, 1977 (see Appendix A).

However, in order to alleviate the current solids handling deficiencies and to promote reclamation of the effluent, EPA may release construction grant funds for the preferred projects described in this EIS subject to the acceptance by LVMWD/TCSD of the following grant conditions:

1. LVMWD/TCSD shall continue working with those local agencies responsible for implemention of air quality mitigation measures to develop a program to alleviate the adverse secondary air quality impacts generated by the population accommodated by the increased capacity of the Tapia WRF.

2. The above mentioned program must be approved by EPA and appropriate state and local agencies prior to release of a Final EIS for an effluent disposal project to handle the full 8 mgd capacity of the Tapia WRF.

3. Quarterly reports must be submitted by LVMWD/TCSD to the EPA detailing the progress of the steps required in condition 1 above. If it is determined that a good faith effort is not occurring on the part of LVMWD/TCSD, further grant payments by EPA for the projects described in this Final EIS will be subject to suspension.

In conclusion, EPA proposes to offer grant assistance in the amount of 75% of eligible project costs as determined by the State of California subject to the acceptance by LVMWD/TCSD of the grant conditions described in Chapter 7 (Mitigation Measures).

LIST OF PARTICIPANTS

This Final EIS/EIR was prepared under the auspices of the Environmental Protection Agency, Region IX. EPA Staff was supported by the State Water Resources Control Board (SWRCB) and the independent consulting firms of EDAW, Inc., Boyle Engineering, Earth Sciences Associates, Phillips, Brandt and Reddick, and Mighty Fine Research. The following persons participated in the development of this Environmental Impact Statement:

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1.0 Introduction

1.0 INTRODUCTION

The Environmental Protection Agency (EPA) is charged with the implementation of several federal statutes:

1. Clean Air Act
2. Federal Water Pollution Control Act (FWPCA)
3. Solid Waste Disposal Act
4. Noise Control Act
5. Pesticide Control Act
6. Safe Drinking Water Act

Each statute has a single-purpose focus with orientation towards the control or abatement of their respective pollution concerns. The National Environmental Policy Act (NEPA) of 1969, has placed the responsibility with EPA to provide an environmental quality overview in federal decision making. EPA is a regulatory agency responsible for the implementation of environmental legislation in the fields of water and air pollution, solid wastes, pesticides and radiation. EPA sets national standards; implements pollution control programs in coordination with the states; provides planning guidance and technical assistance; and enforces national standards.

The regulatory framework for air pollution control is built around a series of control strategies to limit emissions of pollutants from stationary sources, to review new sources of pollution and to control emissions from mobile sources by means of various transportation control measures.

In the area of water pollution control, EPA's regulatory approach is supplemented by federal grants to assist in the construction of municipal treatment facilities. The regulatory framework for water pollution control involves the issuance of permits to discharge wastewater into navigable waters. These permits are known as NPDES (National Pollutant Discharge Elimination System) Permits. The discharge from a municipal sewage treatment plant is subject to an NPDES Permit specifying limitations on the effluent to be discharged. Violations of the permit requirements are subject to direct enforcement action.

Recognizing that a regulatory approach to water pollution control would involve large capital outlays by local governments, Congress expanded the grant program in the 1972 FWPCA Amendments, to assist in the construction of municipal wastewater facilities. The federal share of the capital cost was set at 75 percent, and eligibility criteria was defined.

To insure that water quality goals were met in a cost-effective manner, Congress placed heavy emphasis on planning. Therefore, pursuant to Section 201 of the FWPCA, a wastewater treatment facilities plan must be prepared by the applicant for these federal funds. The plans must also comply with all pertinent requirements of the Clean Air Act and other applicable federal, state and local environmental laws and regulations.

Under the authority of NEPA, EPA published regulations on April 14, 1975, for the preparation of environmental impact statements. Based on criteria set forth in these regulations, and the significant controversy surrounding past projects related to sewering and disposal techniques in the Las Virgenes and Malibu Study Area, and evidence that this controversy will continue, EPA decided that an environmental impact statement would be prepared. This EIS/EIR has also been prepared in accordance with the California Environmental Quality Act (CEQA) of 1970 and its implementing guidelines.

1.1 BACKGROUND

Along the southern portion of the Los Angeles County and Ventura County boundary are three bordering jurisdictions with responsibility for wastewater collection, treatment, and disposal. These are the Las Virgenes Municipal Water District, the Triunfo County Sanitation District, and the Los Angeles County Sanitation Districts. Triunfo County Sanitation District is wholly located in Ventura County while the others are within Los Angeles County.

Las Virgenes Municipal Water District

Las Virgenes Municipal Water District (LVMWD) comprises an area of approximately 78,500 acres with a 1970 population of 19,000 and includes communities of Agoura, Calabasas, Chatsworth, Lake Manor, City of Hidden Hills, Cornell, Malibu Lake, Monte Nido, Lake Lindero, Westlake Village and communities in Decker, Latigo and Corral Canyons, and Twin Lakes. Most of the wastewater collected within the District flows by gravity to Malibu Canyon and thence to the Tapia Water Reclamation Facility. Other wastewater is pumped or trucked to the Tapia treatment plant from the Calabasas area and from areas outside the district. (Pepperdine College in Malibu and portions of unincorporated areas in Los Angeles County adjacent to the District.)

Triunfo County Sanitation District

Triunfo County Sanitation District (TCSD) is located in the Ventura County portion of the Malibu Creek Drainage Area. This district covers 22,200 acres of primarily undeveloped land; however, major urban growth has been underway and has occurred in discontinuous areas within the district. Within the Malibu Creek drainage basin, the Las Virgenes Municipal Water District lies downstream of TCSD and treates wastewater generated in TCSD at the Tapia Water Reclamation Facility. This facility was developed by a joint powers agreement between the two districts. LVMWD is the contracting agency for the elements of wastewater collection, treatment and disposal, constructed and used jointly by the two districts. Each district is entitled to share in system capacity based on its respective pro rata contribution. The joint facilities consist of the Tapia Water Reclamation Facility, a reclaimed water system, and a trunk sewer system which were all put into operation in 1972.

Los Angeles County Sanitation Districts

Of the several Los Angeles County Sanitation Districts, there are two which have been formed with jurisdictional responsibility for sewage treatment in the remaining Study Area. These are Sanitation District Number 27 and Sanitation District Number 33. Sanitation District Number 27 comprises a small area near the coast, adjacent to the City of Los Angeles. This District presently exports its sewage to the City of Los Angeles under contract. Sanitation District Number 33 consists of a portion of the coastal area commonly known as the Coastal Malibu. This district is presently inoperative due to the defeat of several elections to authorize sale of bonds for construction of sewage treatment facilities. The area does not have a community sewer system with the exception of five small sewage treatment plants serving a few concentrated building units and a pumped line from Pepperdine University to the Tapia Water Reclamation Facility.

1.2 HISTORY OF THE PROJECT

1.2.1 LVMWD and TCSD

A chronology of significant events is listed in Table 1 summarizing the history and background leading to the present development of this EIS.

The Las Virgenes Municipal Water District was formed in 1958 to obtain and supply imported water for its citizens. This enabled the first water to be delivered to a small number of existing residents in 1963. In the same year, a Sanitation Improvement District (U-1) was formed in portions of the Las Virgenes Municipal Water District draining to Malibu Canyon. Bonds in the amount of $8.4 million were approved at that time. In 1964, a second Sanitation Improvement District (U-2) was formed in the Calabasas area of the LVMWD to provide maintenance and operation of an existing 100,000 gallon per day treatment plant installed by the developers of the Mulwood subdivision. At the time of formation, bonds in the amount of $3.2 million were approved.

During this same period, the Triunfo County Sanitation District was formed in a portion of Ventura County also tributary to Malibu Creek and a joint powers agreement was developed in October of 1964. This joint power agreement was created to install, maintain and operate a sewerage system to serve the Triunfo County Sanitation District and the Sanitation Improvement District within the Malibu Creek Watershed of the Las Virgenes Municipal Water District.

The Tapia Treatment Plant was then constructed and went into operation in October of 1965 with a capacity of 500,000 gallons per day at a cost of approximately $420,000. This facility utilizes an activated sludge treatment process with aerobic digestion for solids handling.

As further urban development occurred in this area, it became evident that the treatment plant would require expansion. In June of 1968, the plant was expanded to a capacity of 2 million gallons per day with a continuation of the activated sludge treatment. This was developed at a cost of $446,000 with one-third contributed by the Federal Grant Program. It became apparent, however, that as sewage flow increased to over 1 million gallons per day, the effluent disposal on the hillside at the plant was not able to be contained without run-off to adjacent Malibu Creek.

In 1969, the Las Virgenes Municipal Water District, as the contracting agency and operator of the Tapia Plant, applied to the Los Angeles Regional Water Quality Control Board for quality standards to be set to allow effluent to enter Malibu Creek. Quality standards were adopted by the Regional Board in July, 1969 with a requirement that the waste discharge not contain nutrient concentrations that would result in inordinate proliferation of algae, plankton or other undesirable biotic growth. In a series of public hearings, it was determined that although heavy biotic growth existed both upstream and downstream from the plant, additional discharge from the plant could threaten to violate this quality standard and the Regional Board ordered the Las Virgenes Municipal Water District to discontinue discharging their effluent into the creek by July, 1971.

At about the same time, engineering studies were underway to consider transfer of sewage from the Calabasas area of LVMWD (U-2) to the Malibu Creek drainage basin and to the Tapia Plant. This seemed to be the best course of action and the Mulwood Treatment Plant in Calabasas was abandoned and two parallel force mains with two pump lift stations were constructed to enable sewage to be pumped into the network connecting with the Tapia Plant. This was developed in 1970 with a portion financed through the state and federal "Clean Water" Grant Program.

As a result of the order by the Los Angeles Regional Water Quality Control Board to case effluent flow into Malibu Creek, the joint venture began installation of a reclaimed water system. This was placed into service in November of 1971 and essentially completed by February, 1972. At the same time, the Tapia Treatment Plant capacity was enlarged to handle 8 million gallons per day; however, solids handling and other minor facilities were kept to a capacity of 4 million gallons per day, thus limiting the plant processing capability to 4 million gallons per day. The solids handling capacity was kept to 4 million gallons per day to enable further consideration of alternative solids handling processes, thus insuring the selection and development of the most efficient and effective system as needs arose. The expansion of the plant to this level cost approximately $2.8 million with 80% funded by State and Federal Clean Water Grant Programs. At the present time, the flow at the plant is over the 4 million gallon per day solids handling capacity.

In 1974, the LVMWD-TCSD joint venture made application to the State Water Resources Control Board for additional funding under the Clean Water Grant Program to develop the sewage treatment facilities to its full capacity. The application involved the further development of the solids handling capabilities, and further development of the liquid effluent disposal system to resolve the uncertainty of the present disposal arrangements and provide fail-safe backup systems.

At this time, a citizens committee was formed to assist in the development of viable methods of effluent disposal.

Based on the citizen's committee recommendation to the LVMWD Board of Directors, EPA and the State Water Resources Control Board were asked to approve the utilization of recreational lakes as a method for effluent disposal. Approval of recreational lakes for effluent disposal was denied since the reuse of effluent for recreational lakes was considered a "holding" action rather than a "disposal" action. (It should be noted here that this policy has been revised and the use of recreational lakes for effluent disposal is now a viable alternative and eligible for Clean Water Grant Funds.)

Although the citizen's committee recommendation was denied, the overall grant application was approved by both the State Water Resources Control Board and the EPA in late 1974, but with the condition that the coastal Malibu area be incorporated into the Area Wide Facilities Plan. A notice of intent to prepare an Environmental Impact Statement (EIS) was distributed by the EPA in March of 1975. In May of 1975, these two agencies further directed that the Topanga Canyon area be included in the Area Wide Facilities Plan, thus expanding the coverage of the Plan to the scope treated in the Draft EIS/EIR.

Table I
Chronology of Events

1958 --	*Formation of Las Virgenes Municipal Water District (LVMWD)*
--	*Imported water system placed into operation for Las Virgenes*
--	*First Sanitation Improvement District formed in LVMWD*
1964 --	*Second Sanitation Improvement District formed in LVMWD*
--	*Formation of Triunfo County Sanitation District (TCSD)*
--	*Development of Joint Powers Agreement between LVMWD & TCSD*
1965 --	*Construction of the Tapia Treatment plant with 500,000 gpd capacity by the joint powers*
1966 --	*Los Angeles County Engineer developes Master Plan for Sanitary Sewerage facilities for Coastal Malibu & Topanga*

-- *Los Angeles County Sanitation District 33 formed in Coastal Malibu*

-- *Bond election for construction of sewerage facilities in Coastal Malibu defeated*

1968 -- *Expansion of Tapia treatment plant to 2 mgd capacity*

-- *Los Angeles County Sanitation District 33 enlarged and a new sewerage facilities plan prepared*

-- *Bond election for construction of sewerage facilities in Coastal Malibu defeated*

1969 -- *LVMWD requests Regional Water Quality Control Board for permit to allow effluent disposal into Malibu Creek*

-- *Regional Water Quality Control Boards adopts quality standards for effluent discharge into Malibu Creek*

1970 -- *Regional Water Quality Control Board orders LVMWD to discontinue effluent discharge into Malibu Creek*

-- *State Water Resources Control Board requests that an area wide sewering plan for Coastal Malibu be prepared*

-- *Abandonment by LVMWD of its Mulwood treatment plant and connection of service to Tapia treatment plant*

1971 -- *Los Angeles County Engineers prepares area wide sewerage plan for Coastal Malibu with treatment plant at Corral Canyon*

-- *Bond election for Coastal Malibu area wide plan defeated*

-- *Los Angeles County Sanitation District boundaries revised to smaller area*

-- *Special assessment district within Los Angeles County Sanitation District 33 formed in Coastal Malibu for development of sewerage facilities (County Improvement 2550-M)*

-- *LVMWD TCSD joint venture utilizes Clean Water Grant to expand Tapia treatment plant and installs reclaimed water system to begin effluent disposal by spray irrigation*

1972-- *Special assessment district in Coastal Malibu enlarged (County Improvement 2556-M)*

1973-- *Completion of Draft Environmental Impact Report of sewerage facilities for special assessment district in Coastal Malibu*

-- *State Water Resources Control Board and EPA indicate to Los Angeles County that an area wide plan is prerequisite to state and federal funding*

1974-- LVMWD-TCSD joint venutre request additional Clean Water Grant Funds to complete solids handling portion of Tapia Treatment Plant to full capacity

-- Grant application approved by State Water Resources Control Board and EPA but conditioned with inclusion of Malibu into an Area Wide Facilities Plan

-- Planning and environmental studies for Area Wide Facilities Plan begin

— Citizen Advisory Committee for Malibu formed to coordinate with existing citizen committee for Las Virgenes

1975-- Workshops held to discuss potential alternatives to be studied

-- Notice of intent to prepare an EIS for the Area Wide Facilities Plan distributed by EPA

-- Los Angeles County Engineers and LVMWD-TCSD agree, with concurrence by State Water Resources Control Board and EPA, to include Topanga into Area Wide Facilities Plan

-- Workshop held to describe development of EIS

-- Workshops held to describe development of alternatives

1976-- LVMWD applies for year-round discharge to Malibu Creek. The application was not approved by the Regional Water Quality Control Board. LVMWD is currently appealing the decision

-- LVMWD constructs percolation ponds as an interim method of disposal for the effluent which cannot be reclaimed

-- Regional Water Quality Control Board approves use of the percolation ponds until September 15, 1976.

-- Draft EIS/EIR Area Wide Facilities Plan for Las Virgenes-Truinfo-Malibu-Topanga distributed September 24

-- Public hearings held in Malibu and Agoura on November 17 and 18

1977-- Regional Water Quality Control Board rehears the issue regarding standards for year-round discharge into Malibu Creek; again, set no standards. However, the executive officer of the RWQCB did recommend standards which were adopted by his Board

-- Regional Water Quality Control Board reconsiders earlier decision at their own initiative--no standards set. RWQCB has now referred all matters concerning creek discharge standards to SWRCB for all further actions

-- SWRCB and EPA agree that sludge handling and Calabasas reclaimed water line be split from total Area Wide Facility Plan and be the topic of the Final EIS/EIR. Effluent disposal and projects for Malibu and Topanga would be the topics of a Draft Addendum

-- *EPA requests LVMWD to initiate a process of obtaining mitigation measures and implementation schedules for secondary impacts from affected agencies and governmental bodies*

In September, 1976, EPA, in cooperation with the Las Virgenes Municipal Water District, published a draft EIR/EIS on the Wastewater Management Program for the Las Virgenes-Triunfo-Topanga-Malibu Area. This document was prepared under the requirements of the National Environmental Policy Act of 1969 and the California Environmental Quality Act of 1970. Comments on the draft EIR/EIS were solicited and public hearings were held in Malibu and Agoura on November 17 and 18, 1976. The public comment period closed December 3, 1976.

EPA's review of the public hearing testimony found that although certain elements of the Las Virgenes Wastewater Plan could be approved for Federal funding in the near future, other elements would require additional investigation and public review before grant approval. Consequently, EPA, the California State Water Resources Control Board, Las Virgenes Municipal Water District, Triunfo County Sanitation District and the Los Angeles County Sanitation District agreed upon a procedure with the following elements:

1. The Final EIS/EIR for the Area Wide Facilities Plan will be prepared but will only include the Solids Handling Project at the Tapia Water Reclamation Facility and a reclaimed water line to the Parkway Calabasas Golf Course following the route of a disposal alternative described in the Draft EIS/EIR.

2. A draft addendum EIR/EIS will be prepared to further analyze the issues of:

   A. Effluent disposal for the Tapia facility,

   B. Future wastewater management options for Las Virgenes and Triunfo, and

   C. The proposed projects for Malibu and Topanga areas. A public review and comment period on the addendum will occur upon completion of the new document.

The decision to prepare a separate EIR/EIS on the Solids Handling and Calabasas Reclamation Line Projects was necessitated by the urgent need to solve several immediate problems at the Tapia Water Reclamation Facility. First, the inadequate solids handling capability has resulted in odor problems at solids handling capability has resulted in odor problems at the facility. A breakdown of any air blower equipment will create a major odor problem in the area. Secondly, the present effluent disposal facilities are being over-taxed by the present wastewater flows at the Tapia Plant. The reclamation line would carry treated wastewater to the Calabasas Area for reuse on a golf course and other lands as they are made available. Public comments received on the draft EIR/EIS indicated a wide support for reclamation, and this project will help satisfy that desire.

Because the construction of the Solids Handling and Reclamation Line projects will allow more flows to the Tapia Water Reclamation Plant, this Final EIR/EIS will address the secondary impacts associated with the increased flows expected at the plant.

1.2.2 Location and Identification of Study Area

To understand the environmental implications of any proposed action, area limits must be established within a context appropriate to the factors being discussed. Certain factors will need to be discussed on a regional basis, whereas others are more appropriate on a localized basis. For this project, the area limits are:

1. Region: Los Angeles and Ventura Counties. Figure 1 indicates the location of Ventura and Los Angeles Counties with respect to the LVMWD, TCSD, and the portions of Los Angeles County Sanitation District to be studied in more detail.

2. Study Area. The primary Study Area is the geographic area defined by natural drainage basins and appropriate jurisdictional boundaries. This area is the potentially serviceable area and the basic area for this study. It includes the jurisdictional areas of the LVMWD, TCSD and portions of unincorporated, coastal Los Angeles County. This area is shown on Figure 2 and encompassess 228 square miles.

3. Local Specific Project Study Area. The local specific project study areas are those areas within which the projects will actually occur. These study areas include the Calabasas Golf Course, the route for the Calabasas Reclaimed Water Line, and the proposed sludge disposal areas (see Figure 2).

Mt Pinos
Gorman
ANTELOPE
Frazier Mtn
Sandberg
Three Points
Fairmont
Mile 325
Caswell
San Guillermo Mtn
ANGELES
Lake Hughes
Alamo Mtn
NATIONAL
FOREST
Pine Mountain
Pyramid Lake
NATIONAL
Green Valley
Cobblestone Mtn
Warm Sprs Mtn
FOREST
Sespe
STANDARD
PARALLEL
NORTH
SIERRA
Whitaker Pk
Castaic Lake
Wheeler Sprs
VENTURA
Castaic
Agua Dulce
Meiners Oaks
Santa Paula Pk
Val Verde Park
Ojai
Lake Casitas
Sulphur Mountain
Sulphur Springs
Fillmore
Sespe
Saugus
Solemint
Mint Canyon
Oak View
Newhall
LOS
Red Mtn
Casitas Sprs
Santa Paula
Bardsdale
Big Mountain
Oat Mtn
San Fernando Pass
South Mtn
Moorpark
Ventura
Saticoy
Santa Susana
San Fernando
Simi
Montalvo
El Rio
Northridge
Sepulveda
Sun Valley
Canoga Park
Reseda
Van Nuys
Camarillo
Oxnard
Newbury Park
Woodland Hills
Encino
N Hollywood
Burbank
GLENDALE
La Jolla Pk
Hollywood
Beverly Hills
Pacific Palisades
LOS ANGELES
Culver City
Inglewood
Hawthorne
Lawndale
TORRANCE
Lomita
Rolling Hills Estates
San Pedro

EIS/EIR
Las Virgenes-Triunfo
Malibu-Topanga
Area Wide Facilities Plan

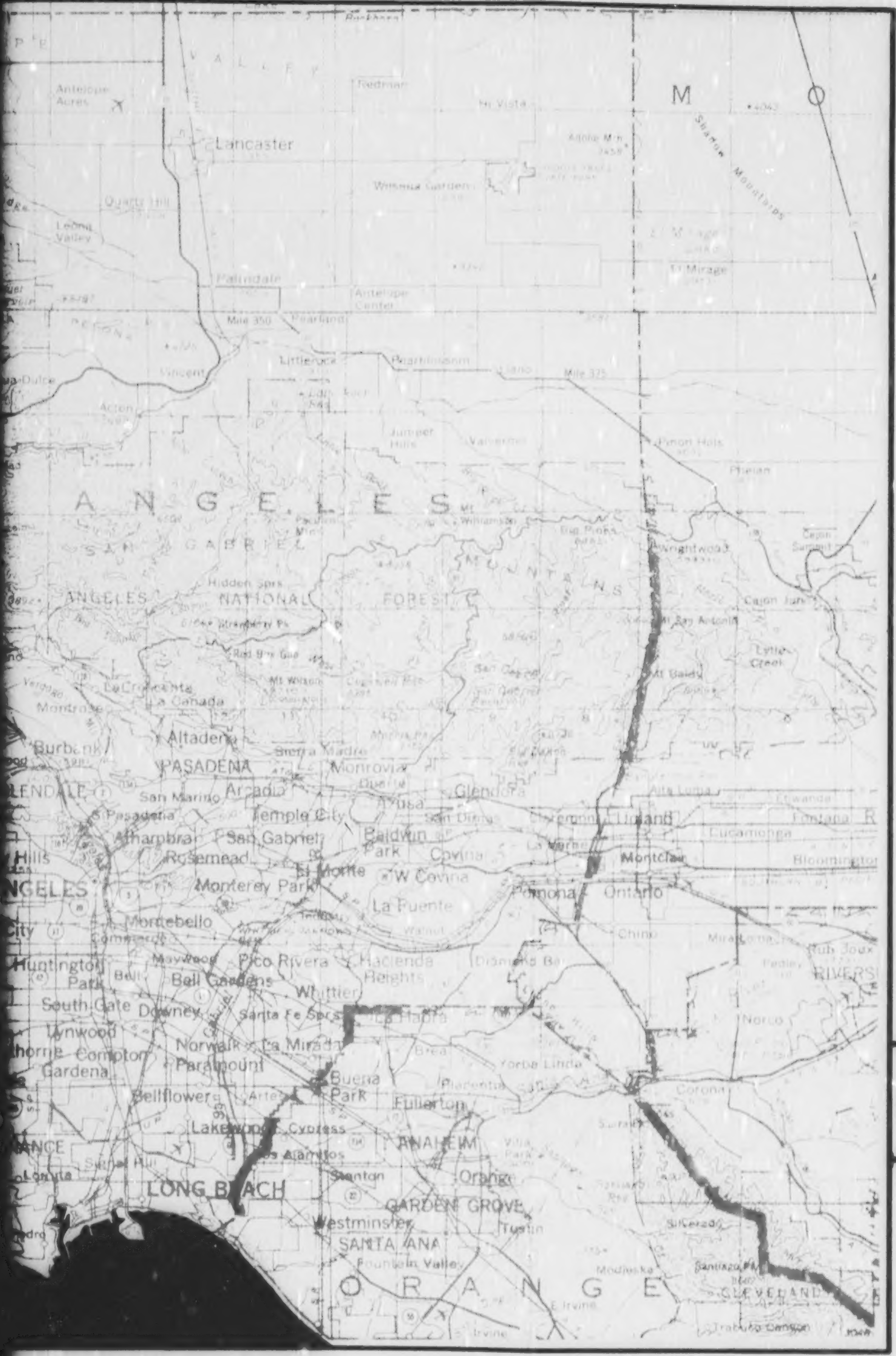
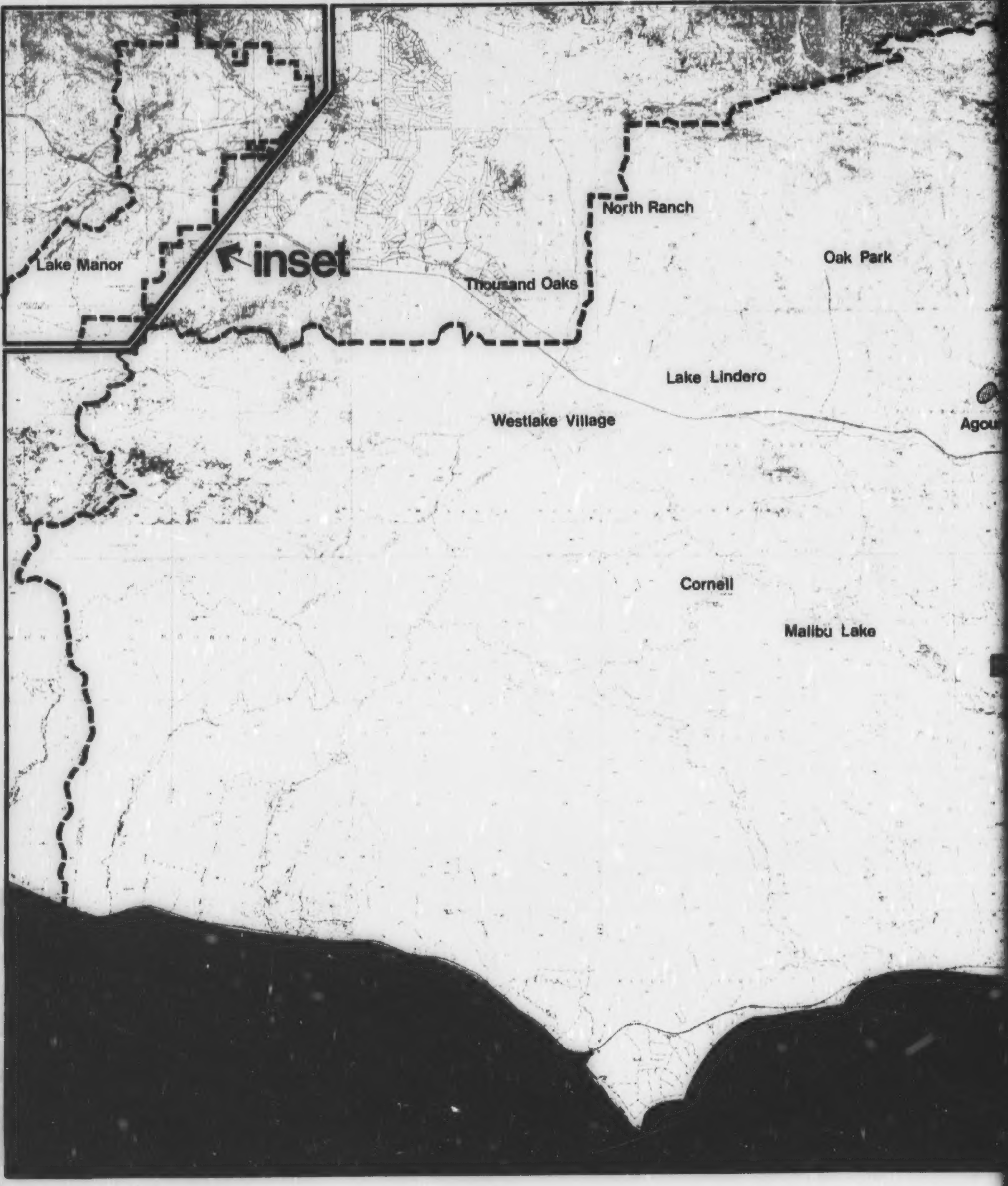
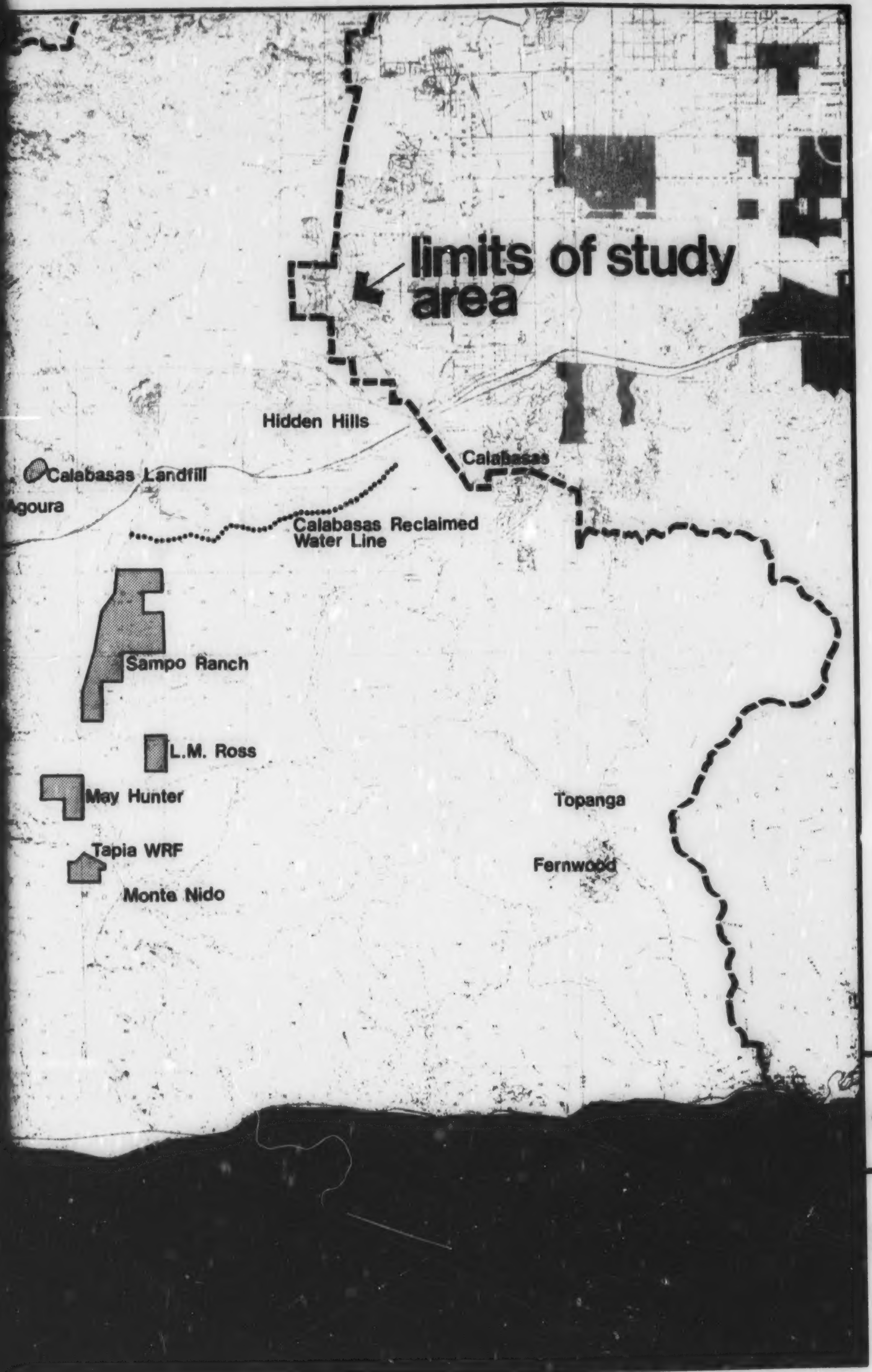

Antelope Acres
Redman
Hi Vista
M
O
Lancaster
Quartz Hill
Wilsona Gardens
Shadow Mountains
Leona Valley
Palmdale
Antelope Center
El Mirage
Pearland
Littlerock
Pearblossom
Vincent
Acton
Juniper Hills
Valyermo
Pinon Hills
Phelan
A N G E L E S
SAN GABRIEL
MOUNTAINS
Mt Williamson
Wrightwood
Cajon Summit
ANGELES NATIONAL FOREST
Hidden Sprs
Strawberry Pk
Mt San Antonio
Lytle Creek
Mt Baldy
Mt Wilson
La Crescenta
La Canada
Montrose
Burbank
Altadena
Sierra Madre
PASADENA
Monrovia
Arcadia
Glendora
Duarte
GLENDALE
San Marino
S Pasadena
Temple City
Alhambra
San Gabriel
Baldwin Park
San Dimas
Claremont
Upland
Alta Loma
Etiwanda
Cucamonga
Fontana
Rosemead
El Monte
Covina
W Covina
La Verne
Montclair
Bloomington
Monterey Park
Pomona
Ontario
LOS ANGELES
La Puente
Montebello
Commerce
Chino
Mira Loma
Rubidoux
Maywood
Pico Rivera
Hacienda Heights
Huntington Park
Bell
Bell Gardens
Whittier
RIVERSIDE
South Gate
Downey
Santa Fe Sprs
La Habra
Norco
Lynwood
Norwalk
La Mirada
Brea
Compton
Gardena
Paramount
Buena Park
Yorba Linda
Placentia
Corona
Bellflower
Artesia
Fullerton
Lakewood
Cypress
ANAHEIM
Villa Park
Los Alamitos
TORRANCE
Orange
Stanton
LONG BEACH
GARDEN GROVE
Tustin
Westminster
SANTA ANA
Silverado
Fountain Valley
Modjeska
Santiago Pk
O R A N G E
CLEVELAND
E Irvine
Irvine
Trabuco Canyon
North
0 2 5 10
Miles
Scale

Fig. 1

Regional context

1-10-A


Lake Manor
inset
North Ranch
Oak Park
Thousand Oaks
Lake Lindero
Westlake Village
Agou
Cornell
Malibu Lake


limits of study area
Hidden Hills
Calabasas
Calabasas Landfill
Agoura
Calabasas Reclaimed Water Line
Sampo Ranch
L.M. Ross
May Hunter
Tapia WRF
Monte Nido
Topanga
Fernwood
key to inset
North
0
1000'
5000
2000'
0
3000'
Scale

Primary Study Area

fig. 2

1.3 MAJOR ISSUES

1.3.1 Effluent Disposal

The proposed Calabasas Reclaimed Water Line is an attempt by the LVMWD to resolve an effluent disposal problem by constructing and contracting with the owners of the Calabasas Park Golf Course and adjoining orchard-ranchettes for the long-term purchase irrigation of reclaimed water from the Tapia WRF. The contracted agreement will, at a future time, permit the District to spray irrigate an average flow of 1.3 mgd on the golf course, orchards and landscaped areas. This will effectively and beneficially dispose of approximately one quarter of the effluent currently processed at the Tapia plant, and one-eighth of the effluent that could be processed when the plant is expanded to an 8 mgd capacity.

The proposed project will alleviate the current effluent disposal problems resulting from lack of long-term contracts for sale of the reclaimed water, and the lack of suitable sites in the area for spray irrigation of the reclaimed water. Additional methods besides the Calabasas Line for disposing or using all of the 8 mgd of reclaimed water from the Tapia plant will be further studied in the Draft Addendum. This study will examine the additional options that LVMWD-TCSD has in disposing/using reclaimed water (i.e., disposal to Malibu Creek, creation of recreation lakes, dual water systems for residences to use the reclaimed water for landscaping).

1.3.2 Treatment Capacity

This issue concerns secondary impacts and is related to the capacity of the treatment facilities to be constructed. Construction of the facilities is directly related to the ability of LVMWD to adequately dispose of the increased volume of sludge. The Tapia plant currently has a design capacity of 8 mgd but is restricted to a 4 mgd rate because of the sludge disposal problem.

An increase in capacity at the Tapia plant to 8 mgd could accommodate additional population in the LVMWD-TCSD districts. These increases could amount to approximately 18,900 and 19,000 persons respectively. A total LVMWD-TCSD population of approximately 76,000 (includes the present population of 38,400) could be accommodated.

The EIS is the tool used to investigate the impact of increased capacity on growth and population shifts in the service area and resulting changes to critical parts of the environment, such as air quality.

Secondary impact issues generally relate to the effect of population served by the proposed facilities to the environment. The discussion is not limited to that of "reserve" capacity but also includes service to presently lightly developed areas or areas subject to population shift.

Land use must remain a local prerogative, except as it may adversely affect environmentally sensitive areas or public health. The EIS, therefore, identifies environmentally significant areas and the related constraints in describing the existing environment. Of particular importance for the Santa Monica Mountain area are air quality, geologic hazard zones, fire-prone areas, endangered habitats, flood hazards, open space in public and private areas, and archaeologic and historic sites.

1.3.3 Mitigation Commitment Requirements

This issue is directly related to the secondary impacts which will occur as a result of the increased treatment plant capacity. The issue which is of concern is of the increased air pollution resulting from the additional population treatment accommodated by the increased plant capacity.

The LVMWD/TCSD service area lies in the South Coast Air Basin. This air basin has been classified as a critical air basin since it is not expected to attain 1987 Ambient Air Quality Standards.

Growth projections that assume a zero in-migration into the State and an "E" level of 2.1 births per woman (E-0 growth rate), are used by EPA and the SWRCB for planning sewage treatment facilities in critical air basins. This is done in order to minimize growth related impacts to air quality caused by sewage treatment facilities. These agencies utilize the 10 year E-0 growth rate projection as the fundable basis for any sewerage projects in the basin.

Expanding the Tapia WRF to accommodate an 8 mgd flow (approximately 76,300 to 80,000 persons) could allow population increases to occur above the 10 year E-0 growth rate projection.

As the 8 mgd capacity could accommodate populations above the 10 year E-0 projections for the area, EPA has requested that LVMWD/TCSD adopt a mitigation program for secondary air quality impacts prior to release of this Final EIS. As a result of this request, LVMWD/TCSD has contacted a number of local agencies empowered to enact and implement air quality impact mitigation measures. These discussions have resulted in resolutions from the City of Hidden Hills and the Ventura County Board of Supervisors, as well as from the LVMWD and TCSD Boards of Directors, to participate in the Air Quality Maintenance Plan and coordinate their activities and assist in developing and implementing mitigation measures with the governmental agencies directly responsible for developing and implementing an Air Quality Maintenance Plan.

SWRCB has also placed flow restrictions on the capacity of the Tapia WRF at an E-O growth rate for a 10 year period or until such time as the AWMP is approved and adopted. EPA has also required that conditions be imposed on the award of grant funds.

Until these conditions are accepted by LVMWD/TCSD, the proposed project grant funds will not be released. These conditions are:

1. LVMWD/TCSD continue working with local agencies responsible for implementation of air quality mitigation measures to alleviate the adverse secondary air quality impacts associated with accommodated population of the increased capacity of the Tapia WRF.

2. The air quality impact mitigation program be approved by appropriate state and local agencies, as well as EPA, prior to release of a Final EIS for an overall effluent disposal program to handle the full 8 mgd capacity of the Tapia WRF.

3. LVMWD/TCSD submit quarterly reports to EPA detailing the progress of the steps required in condition 1, above. If it is determined that a good faith effort is not occurring on the part of LVMWD/TCSD, further grant payments by EPA for the projects described in this EIS will be subject to suspension.

Environmental Setting

2.0 ENVIRONMENTAL SETTING

2.1 INTRODUCTION

Chapter 2 of the Environmental Impact Statement describes the environmental setting for only the elements relating to the Calabasas Reclaimed Water Line and the Sludge Handling portion of the Areawide Facilities Plan. Other elements in the draft environmental setting which are not pertinant to these elements have been deleted from this Final EIS but may be included in the Draft Addendum,as appropriate. Environmental setting items in the Draft EIS/EIR which received comments during the public review process and are being deleted in the Final EIS (because they deal with effluent disposal) will be included in the Draft Addendum (with comments).

This chapter has been organized according to individual environmental factor descriptions within the framework of the natural environment or the socio-cultural environment.

The Natural Environment section relates to discussions of basic natural resource systems such as topography, climate, air, hydrology, soils, biota, etc.

Socio-Cultural Environment refers to those areas of concern related to the interdependence of man such as the jurisdictional framework, population, characteristics, land use, historic resources, etc.

Environmental Setting

Natural Environment

2.2 NATURAL ENVIRONMENT

2.2.1 Geographic Setting

The study area is located in Southern California adjacent to the boundaries of Ventura and Los Angeles counties. (Refer to Figure 1.) The primary study area encompasses approximately 146,000 acres of generally mountainous terrain interspersed with hilly interior valleys. The area is primarily rural, undeveloped land, however, certain areas of intense urban development exist along the coast and in certain interior valleys where accessibility has permitted development. Most of this urban development is residential and a function of the suburban growth extending from the Los Angeles metropolitan center located approximately 20 miles to the east. Just west of the study area are the agricultural areas of the Oxnard plain and smaller cities of Thousand Oaks, Oxnard and Ventura.

Located within the study area are the City of Hidden Hills, portions of the City of Thousand Oaks, and portions of the City of Los Angeles. The unincorporated communities of Agoura, Calabasas, Oak Park, Lake Manor, Monte Nido, Lake Lindero, Westlake Village, Malibu, and Topanga are also within the study area.

The area is within the planning basin of the Los Angeles Regional Water Quality Control Board as well as the South Coast Air Basin of the State Air Resources Board.

2.2.2 Climate

The general climate of the study area is characteristic of a mediterranean type consisting of warm, dry summers and cool winters during which most of the year's rain falls.

Air Temperature

Latitude is the major parameter affecting air temperature in most regions of the United States. Lines of equal temperature (isotherms) tend to be parallel and have an east/west orientation. In California, however, altitude exerts a governing influence on temperature and isotherms exhibit a north/south trend which generally follows the topographic contours of the state. The study area is located on latitude 34°3'N and longitude 118°37' W.

Temperature extremes from day to night and season to season generally increase with distance and elevation from the coast. Local topography is a dominating factor in determining the magnitude these temperature fluctuations will assume. The coastal plain of the Los Angeles River Basin is subject to moderate temperatures, with typically small daily and annual fluctuations in extremes.

Some variety in weather conditions results from the dynamic interplay between mild sea breezes and either hot or cold winds from the interior, but temperatures and humidity are normally quite comfortable. Average daily temperature ranges are about 20 degrees in winter and 15 degrees (°F) in summer from minimum to maximum.

In the valleys of the basin, the influence of topography on the circulation of marine air promotes wide variations in climate within short distances. As an example, Santa Monica Pier enjoys a mean daily July maximum of 74.9°F, but the average increases to 95.1°F at Canoga Park in the San Fernando Valley, just 15 miles to the North.[1]

The temperature of the primary study area varies significantly according to specific elevations and proximity to the ocean. The moist ocean air masses have a moderating effect along the coastal slopes and canyons causing cooler temperatures in the summer and warmer temperatures in the winter than those that occur in the inland portions. Average monthly temperatures in January range from 38°F to 68°F for the inland portions and 48°F to 64°F along the coast and in July from 56°F to 95°F inland and 58°F to 75°F along the coast.[2]

Precipitation

Over Southern California there is a large variation in seasonal rainfall from year to year. The majority of locations in the coastal areas have a mean annual precipitation of approximately 12 to 16 inches. In the Santa Monica Mountains the amount is considerably greater. Refer to Figure 3 for precipitation contours of the study area.

Figure 3 has been prepared from data of five rain gauging stations maintained by the Los Angeles County Flood Control District within the study area.

Wind

The study area is located in the South Coast air basin. Refer to Figure 4 for the locational context of the South

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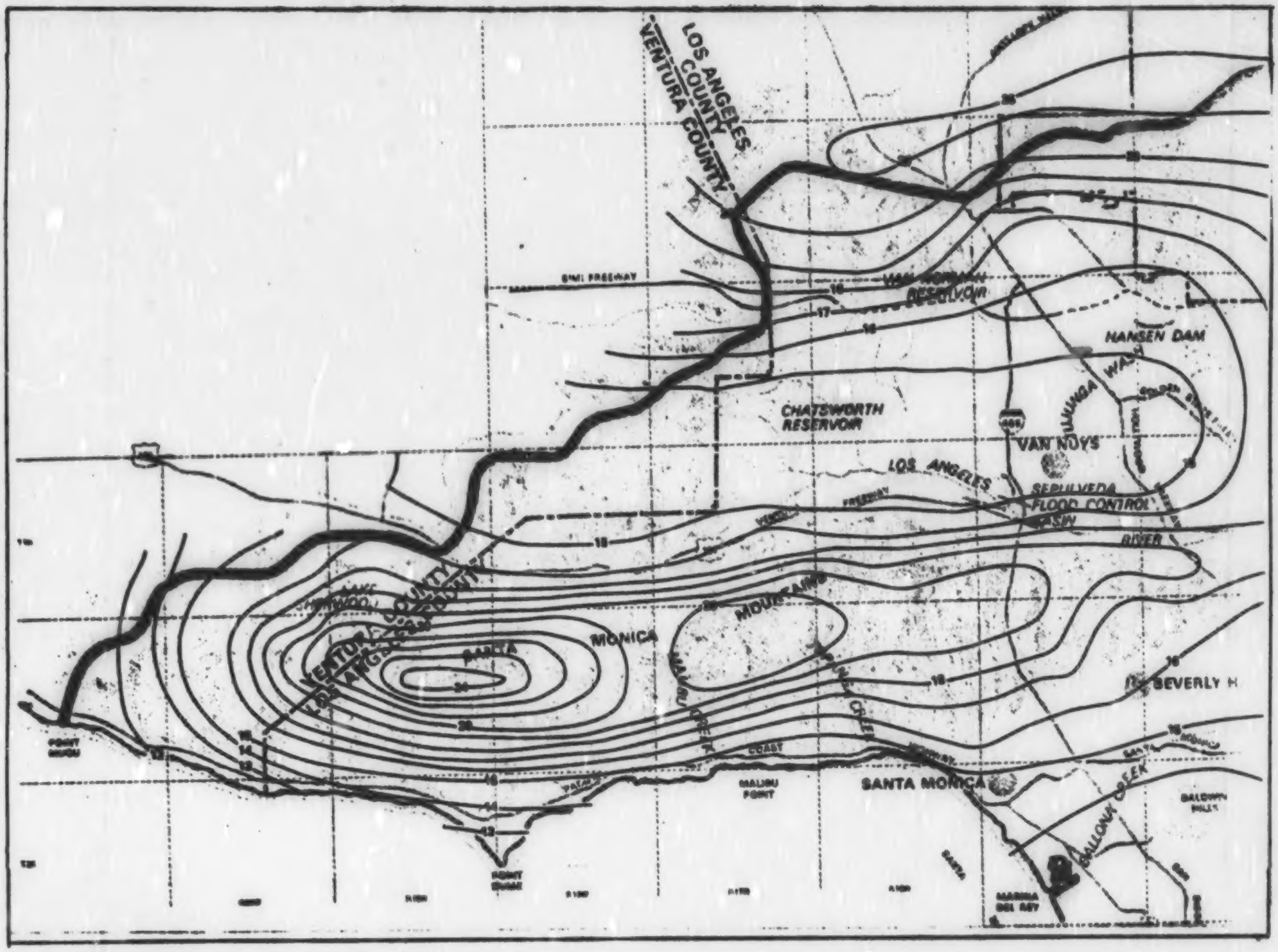
[1] Water Quality Control Plan Report, Los Angeles River Basin (4B), State Water Resources Control Board.

[2] The Malibu Area, Background for Planning, The General Plan, Coastal Malibu - Las Virgenes - Topanga, County of Los Angeles, Regional Planning Commission, April 15, 1965.

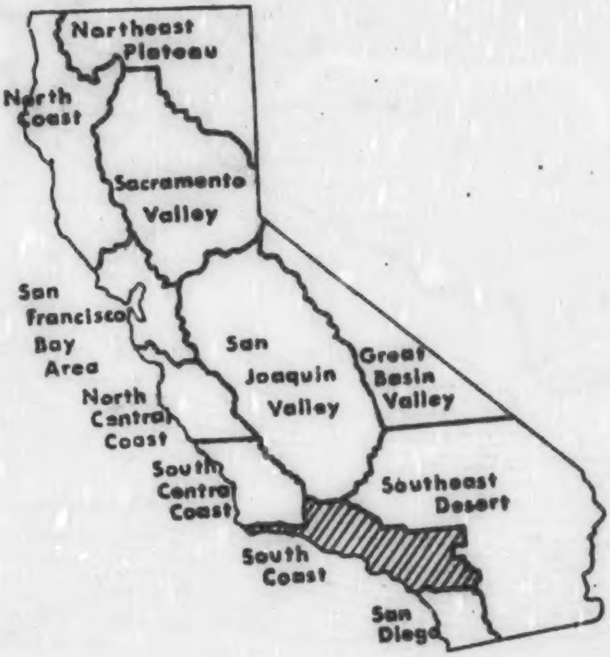
FIGURE 3


LOS ANGELES COUNTY
VENTURA COUNTY
SIMI FREEWAY
VAN NORMAN RESERVOIR
HANSEN DAM
TUJUNGA WASH
CHATSWORTH RESERVOIR
VAN NUYS
LOS ANGELES
VENTURA FREEWAY
SEPULVEDA FLOOD CONTROL BASIN
RIVER
VENTURA COUNTY
LOS ANGELES COUNTY
SANTA
MONICA
MOUNTAINS
MALIBU CREEK
BEVERLY H
COAST
HIGHWAY
POINT MUGU
MALIBU POINT
POINT DUME
SANTA MONICA
BALLONA CREEK
BALDWIN HILLS
MARINA DEL REY

ANNUAL PRECIPITATION CONTOURS FOR

THE SANTA MONICA MOUNTAINS AREA

SOURCE: Water Quality Control Plan Report, Los Angeles River Basin (4B), State Water Resources Control Board


Northeast Plateau
North Coast
Sacramento Valley
San Francisco Bay Area
North Central Coast
South Central Coast
San Joaquin Valley
Great Basin Valley
Southeast Desert
South Coast
San Diego

South Coast Air Basin
Figure 4

Coast air basin in reference to the State of California. During the last 20 years the average wind speed in the region has been approximately 6 miles per hour with some seasonal variations. The annual and monthly direction of wind conditions are shown in Figure 5 depicting wind roses for the Los Angeles region recorded over a 15-year period. In the summer the winds are mainly from the west, southwest, south, and southeast, while in the winter the northerly and northeasterly winds are dominant, due in part, to the more frequent occurrence of storms and "Santa Ana" winds (northeasterly winds from the desert).

To more precisely document the study area's relationship to the South Coast air basin's typical wind patterns, the mean wind patterns and lines of constant velocity are illustrated in Figures 6 through 13.

The South Coast basin's very low average wind speed limits the capacity of the atmosphere to disperse contaminants. Occasional winter storms and infrequent, strong, north easterly "Santa Ana" conditions create wind flows from the mountains and deserts to the sea. The winds occur within 36 hours after the passage of a cold front along the Malibu coast area.[1] The Santa Ana wind conditions are important because of the high potential of fire when this wind condition occurs.

In the study area the natural flow of air on most days of the year is such that at night and in the morning the air passes downward from the seaward side of the mountains over the Santa Monica Bay, and then, in the afternoon it is carried inland with the sea breeze.

The streamline analysis (Figures 6 through 13) presented here is generalized from data compiled from U. S. Weather Bureau data[2] and is based on the most frequent wind occurring during several specified hours of each day for several years. Therefore, this streamline analysis is best interpreted as pictorial flow charts indicating the horizontal transport or general direction of movement of air from place to place. In addition, this analysis indicates where different air flows converge, and where the winds spread out or diverge. The location of these areas is important because: (1) in converging flows near the surface, piling up of air is compensated for by some of the air being pushed aloft and carried away in the upper flow; (2) in areas of surface diverging flow, compensation for the spreading out is accomplished by air descending from aloft. The diverting of winds around obstructions is seen at the coastal islands

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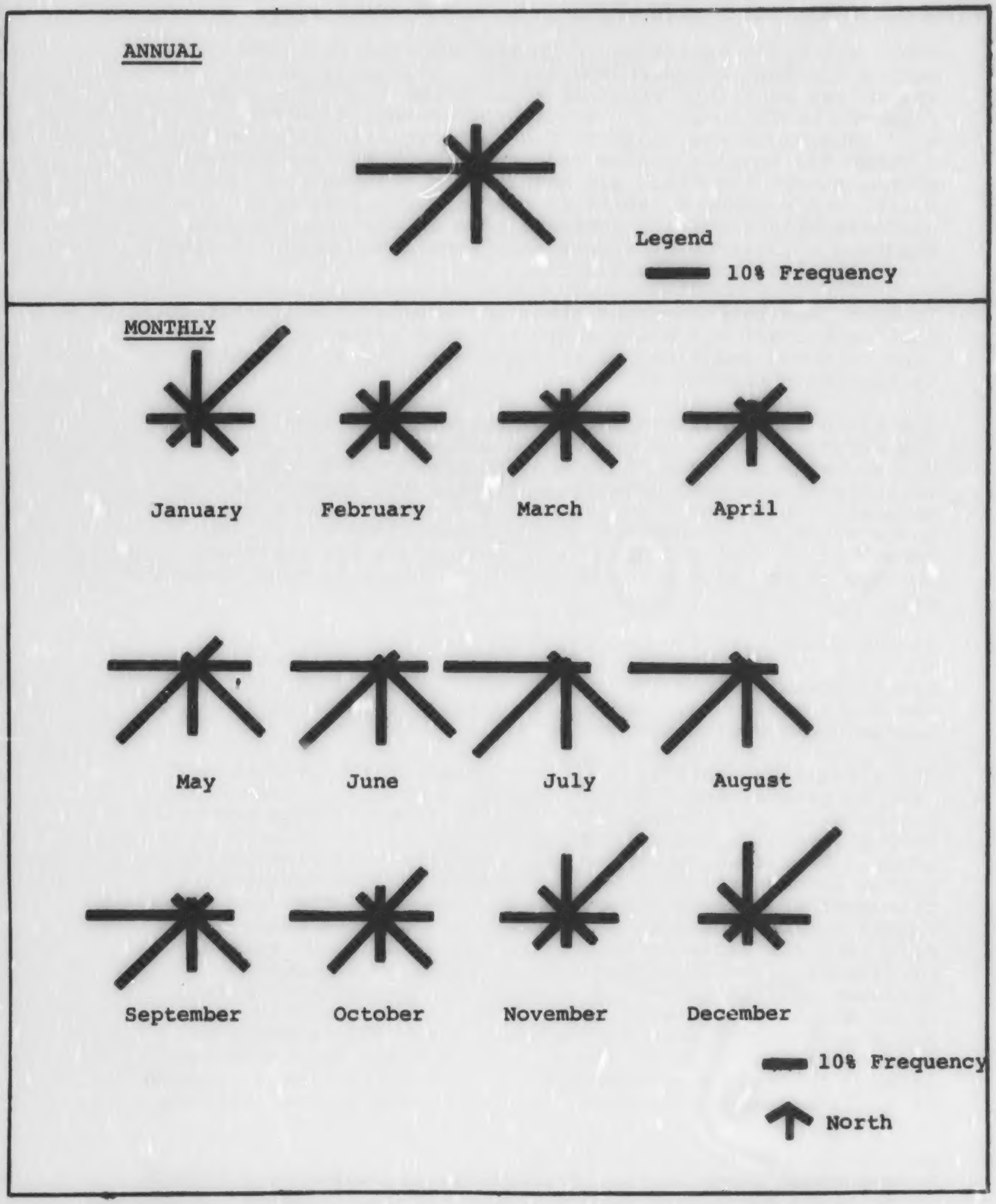
[1] Technical Paper No. 54, Meteorological Summaries Pertinent to Atmospheric Transport & Dispersion over Southern California U. S. Weather Bureau, 1965.

[2] IBID.



Annual and Monthly Daytime Wind Roses for Los Angeles, 15 year Averages
Source: Regional Water Control Board

Figure 5

and on the western sides of the Santa Ynez and Santa Monica Mountains and the Palos Verdes Hills.

The following seven figures illustrate the most frequent wind plan; one for the typical nighttime situation and one for the typical daytime situation for each mid-season month that is considered representative of the season (i.e. January, April, July, October).

1. July (Summer)

The daytime summer flow is a landward flow from the ocean, primarily from the southwest and west, caused by a broad high pressure area over the Pacific Ocean with a differential heating of air over land and over the ocean. The greater heating of air over land than over the ocean causes a replacement of the warm dry inland air by the more dense cold air from the ocean. This flow pattern changes during the evening and nighttime and nighttime flow is mostly from the northeast and is not well developed. The net average transport of air during a 24 hour period is greater in the summer than in any other season.

A strong divergence zone over the primary study area occurs in the summer beginning near Pt. Mugu and extending near the Las Virgenes Valley where a convergence appears to occur (see Fig.6). This would indicate that the heavier ocean air coming through the study area is probably being drawn down by air descending from aloft causing inversion levels to be lower. This is significant when considering the impact on air quality that a lower inversion level can have on dispersion of air pollutants. Inversion and its relationship to the study area will be discussed later in this report.

2. October (Fall)

The daytime Fall flow pattern are similar to those for the summer months, but to a lesser degree in terms of wind velocity and duration. The landward flow from the ocean however is felt further inland than in summer and is a result of an east-southeast movement of the high pressure area over the Pacific combined with the greater differential heating of air over inland areas with heating of air over the ocean.

The nighttime airflow analysis (Fig. 9) shows a well organized land breeze flow towards the ocean as the prevailing feature. Down slope and down canyon flows are evident everywhere including the coastal valleys and coastal shelf areas. This nighttime airflow is well marked and straight forward with no complicated flow patterns shown.

3. January (Winter)

January daytime flow also resembles the Summer and Fall daytime flows, however average speeds and frequency of the onshore flow is least in January. The differential heating of air over land and ocean is not as great as in the Summer or Fall, although there is enough difference so that air from over the ocean moves in to replace the less dense air over the land. The high pressure area in the Pacific is relatively weak during this time and combined with the small amount of differential heating, is largely responsible for the low wind speeds and frequencies. The result is that the average air transport is lowest in January than at any other time.

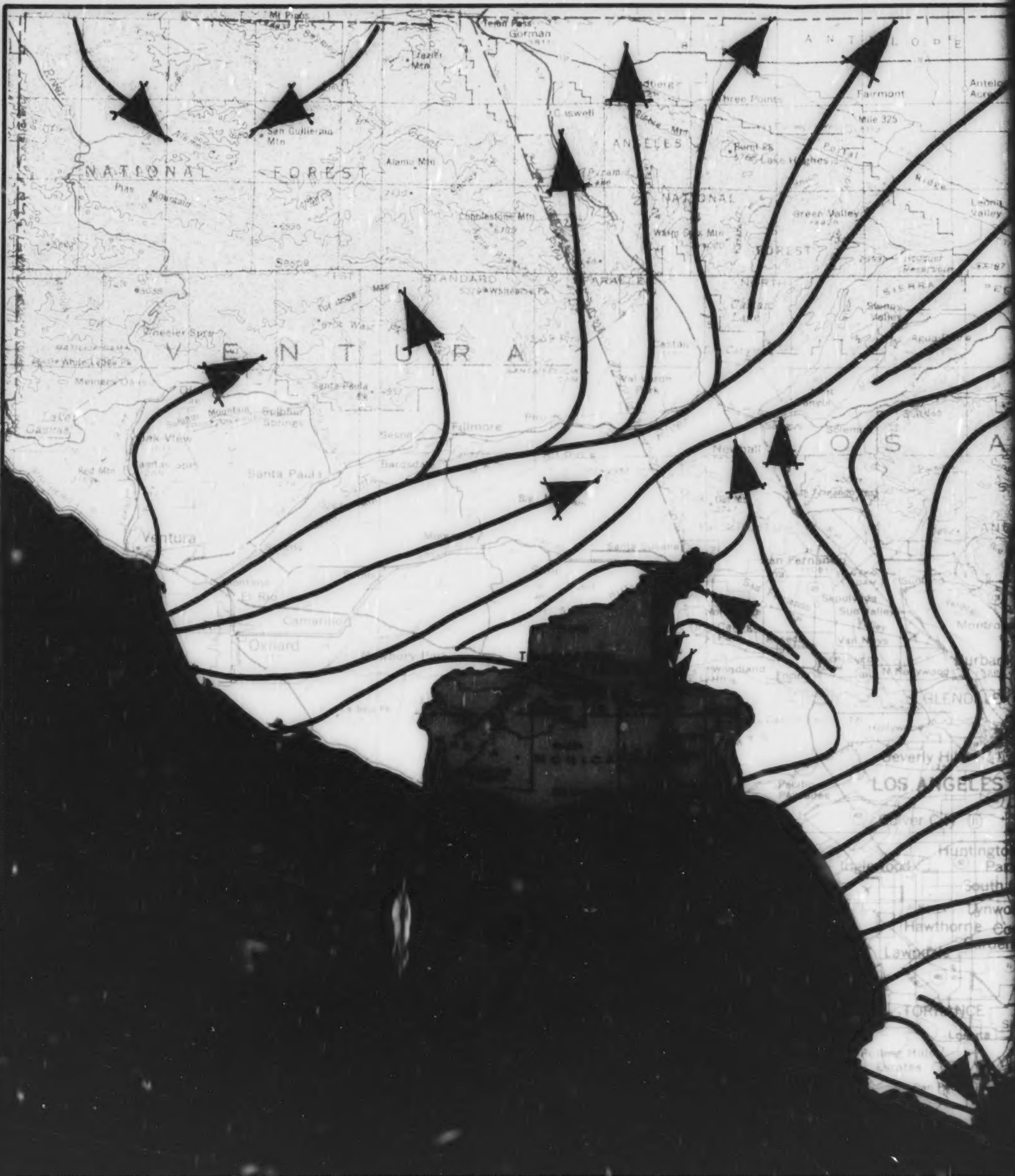
The nighttime oceanward air flow pattern in January reaches its greatest development and down canyon and down slope flows are uncomplicated and evident throughout the area. All canyons and valleys which have outlets to the ocean show a flow in this direction.

4. April (Spring)

The April daytime air flow is similar to those of the other months analyzed and most resembles the July daytime pattern. The April wind flow from ocean to land are marked and speeds are greater than at other seasons. However, even though coastal winds are strongest in this month, the net 24 hour transport of air is less than July because the flow does not persist for as many hours in the 24 hour day nor is the flow over land a strong unidirectional flow as in July.

The nighttime air flow for April also shows a land to ocean flow but is not as well organized as that of January but is more pronounced than that of July. Although most coastal areas have a nighttime offshore flow in April, there are several exceptions. For example, there is a dual flow in the Point Mugu area and the convergence zones are closer to the coastline in April than in January.

In summary, the daytime air flow during the year is a landward flow from the ocean which has its greatest speeds in April and decreases through the year to a low in January. However, the more significant net average air transport is greatest in July, second largest in April, third largest in October, and least in January. This landward flow from the


Mt Pinos
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ANTELOPE
San Guillermo Mtn
Alamo Mtn
NATIONAL FOREST
Pine Mountain
Cobblestone Mtn
Sespe
STANDARD
PARALLEL
Whitaker Pk
Wheeler Sprs
VENTURA
Santa Paula Pk
Lake Casitas
Oak View
Sulphur Mountain
Sulphur Springs
Fillmore
Bardsdale
Santa Paula
Red Mtn
Ventura
El Rio
Camarillo
Oxnard
Caswell
Pyramid
ANGELES
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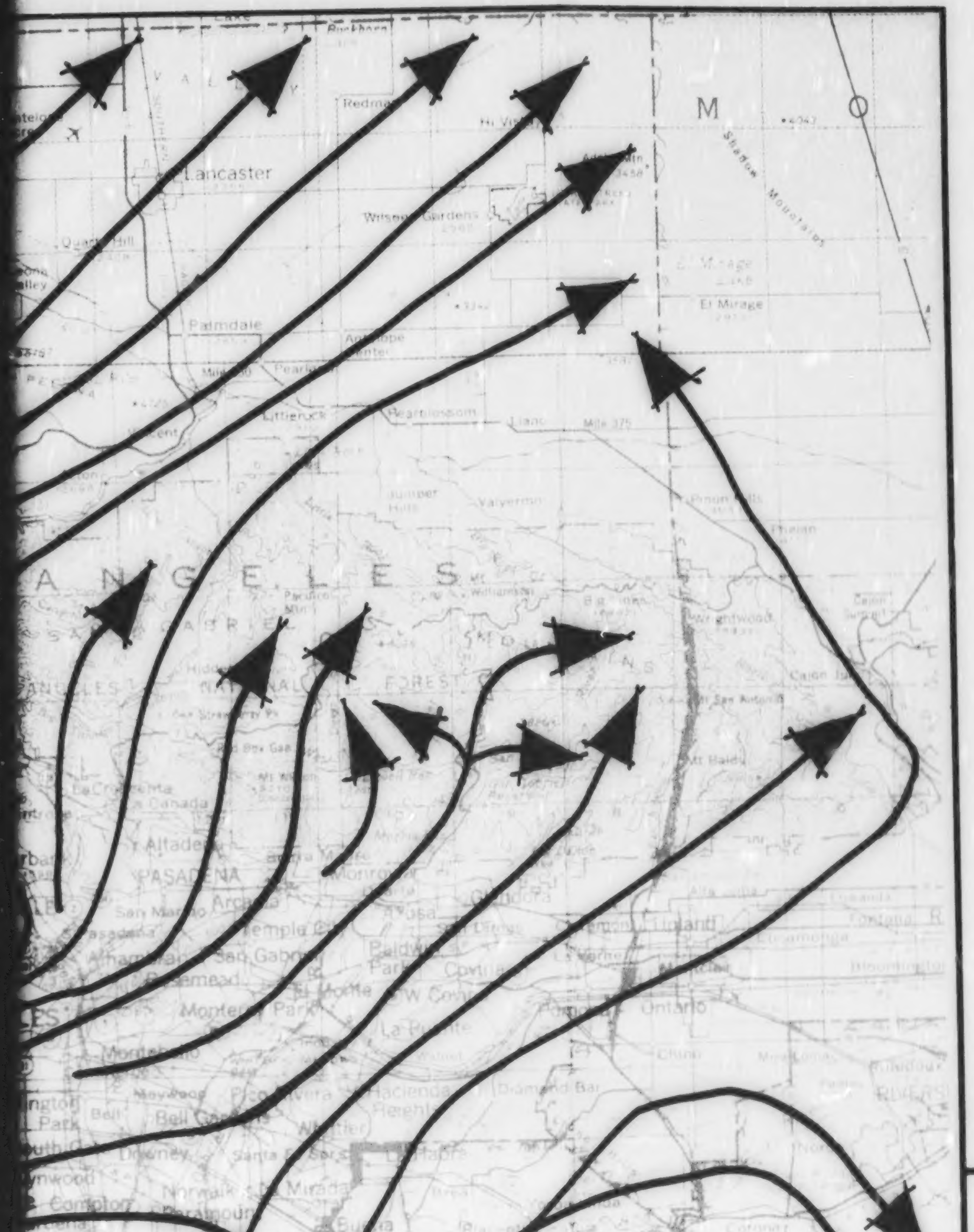
FOREST
Three Points
Lake Hughes
Fairmont
Mile 325
Ridge
Green Valley
Leona Valley
Antelope Acres
Castaic
SIERRA
PELONA
Agua Dulce
Newhall
Saugus
LOS A
San Fernando
Sepulveda
Van Nuys
Encino
Woodland Hills
N Hollywood
Sunland
Montrose
Burbank
GLENDALE
Beverly Hills
LOS ANGELES
Culver City
Inglewood
Huntington Park
South
Lynwood
Hawthorne
Compton
Lawndale
Gardena
TORRANCE
Lomita
Rolling Hills Estates

EIS/EIR
Las Virgenes-Triunfo
Malibu-Topanga
Area Wide Facilities Plan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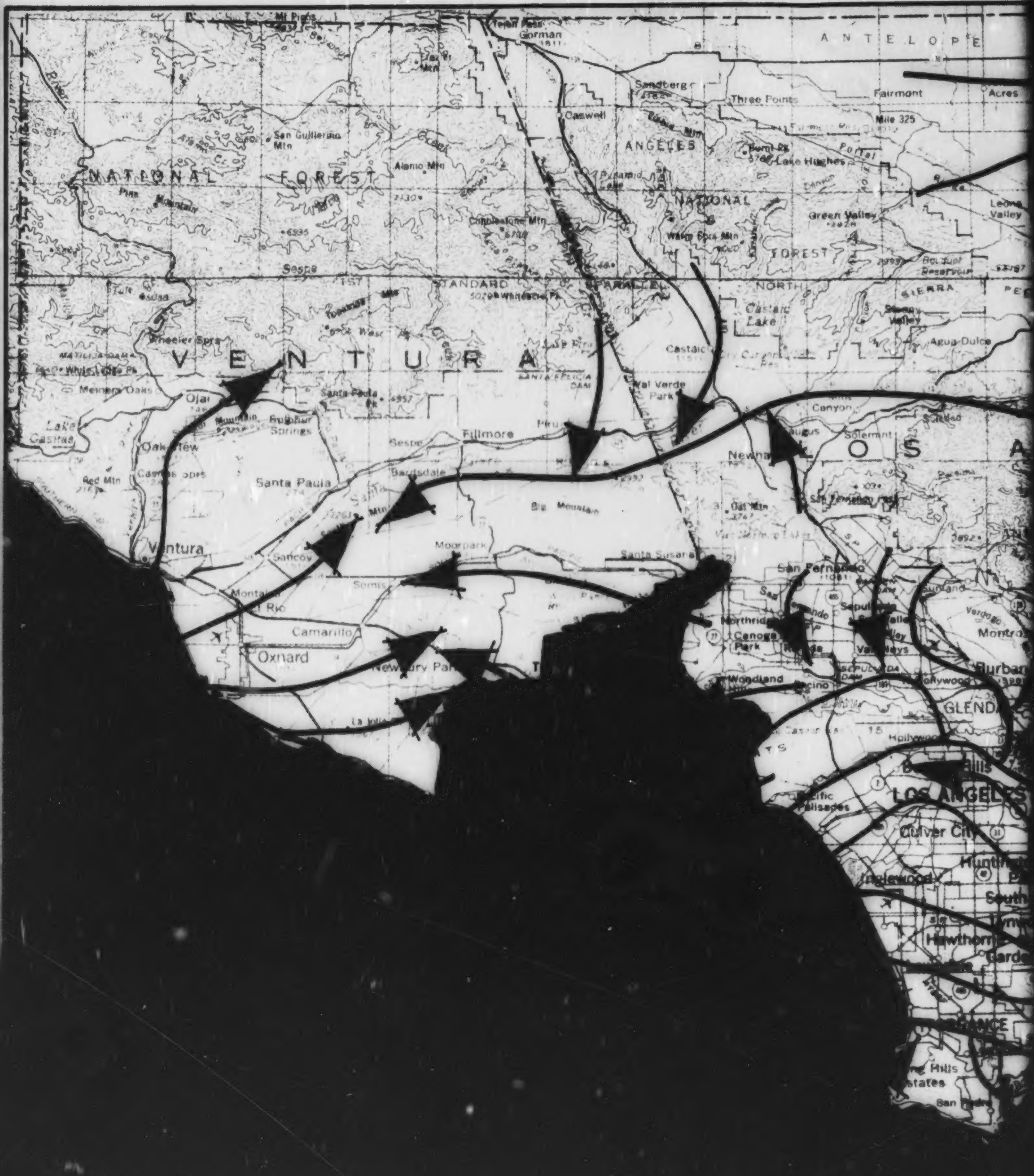
NATIONAL FOREST
Wrightwood
Phelan
Pinon Hills
Mt Baldy
Cajon
La Crescenta
Altadena
PASADENA
Arcadia
Monrovia
Glendora
San Marino
Temple City
Alhambra
San Gabriel
Rosemead
El Monte
Monterey Park
Baldwin Park
Covina
W Covina
La Puente
Upland
Ontario
Pomona
Chino
Montebello
Pico Rivera
Hacienda Heights
Diamond Bar
Bell Gardens
Downey
Whittier
Norwalk
La Mirada
Paramount
Compton
Lynwood
Bellflower
Buena Park
Fullerton
Cypress
Los Alamitos
Lakewood
LONG BEACH
Stanton
ANAHEIM
Orange
GARDEN GROVE
Westminster
SANTA ANA
Tustin
Fountain Valley
Irvine
Corona
Fontana
Cucamonga
Bloomington
Norco
RIVERSIDE
O R A N G E

Fig. 6

North
0 2 5 10
Miles
Scale

July
Daytime

2-9-A



ANTELOPE
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Sandberg
Three Points
Fairmont
Acres
Caswell
Mile 325
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Lake Hughes
San Guillermo Mtn
Alamo Mtn
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VENTURA
Castaic
Val Verde Park
Meiners Oaks
Ojai
Santa Paula Pk
Sulphur Springs
Fillmore
Canyon
Saugus
Solemint
Lake Casitas
Oak View
Sespe
Newhall
LOS A
Red Mtn
Casitas Sprs
Santa Paula
Bardsdale
Big Mountain
Oat Mtn
Ventura
Saticoy
Moorpark
Santa Susana
San Fernando
Montalvo
El Rio
Somis
Sunland
Northridge
Camarillo
Canoga Park
Reseda
Van Nuys
Montrose
Oxnard
Newbury Park
Woodland Hills
Encino
Burbank
GLENDALE
La Jolla
Hollywood
Pacific Palisades
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Culver City
Huntington Park
Inglewood
Hawthorne
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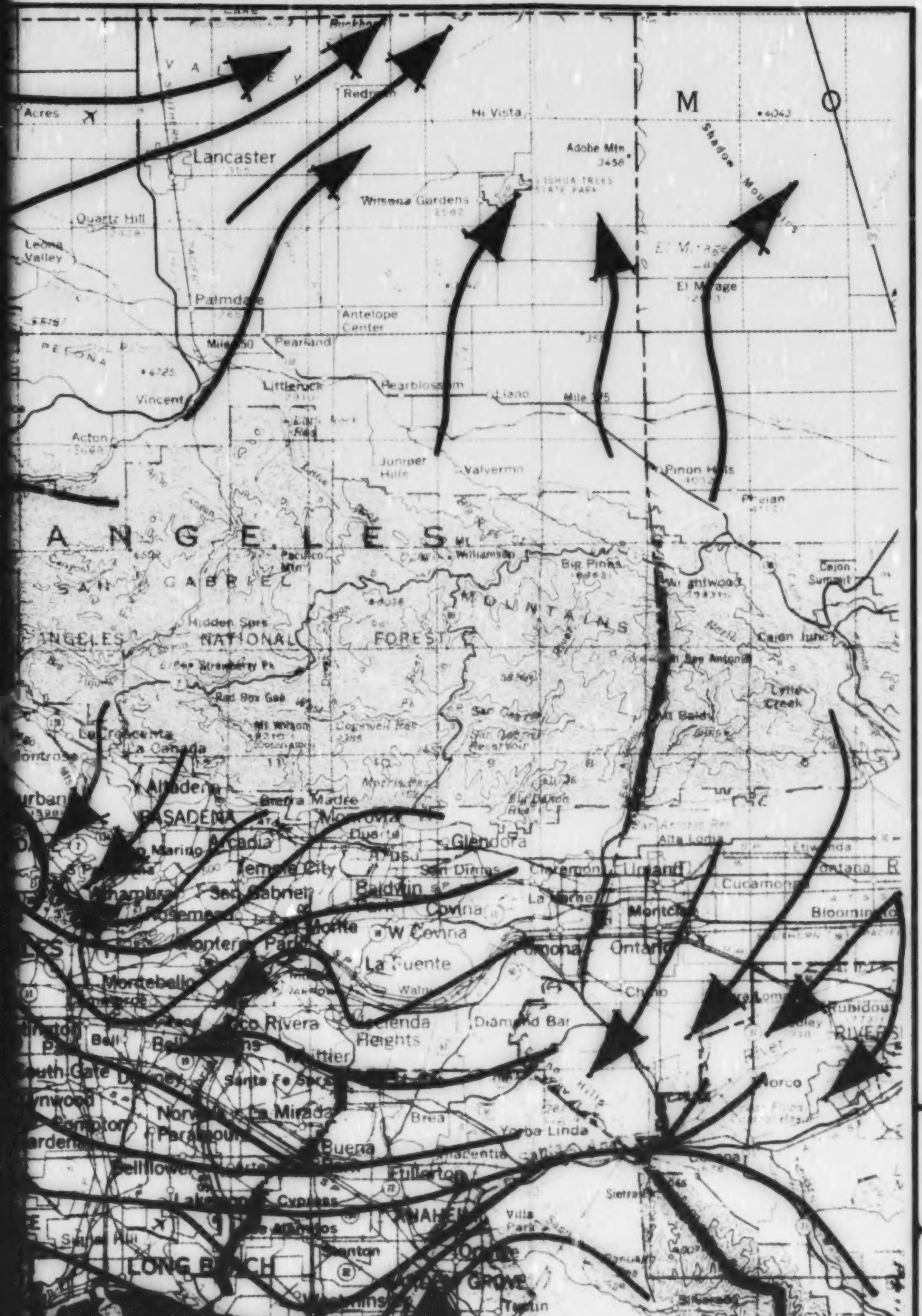
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Redman
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Phelan
A N G E L E S
SAN GABRIEL MOUNTAINS
ANGELES NATIONAL FOREST
Wrightwood
Big Pines
Cajon Summit
Cajon Junction
Lytle Creek
Mt Baldy
La Crescenta
La Canada
Altadena
PASADENA
Sierra Madre
Monrovia
Arcadia
Duarte
Glendora
San Dimas
Claremont
Upland
Cucamonga
Temple City
San Gabriel
Alhambra
Rosemead
Baldwin Park
Covina
W Covina
Montclair
Pomona
Ontario
Monterey Park
La Puente
Montebello
Chino
Pico Rivera
Hacienda Heights
Diamond Bar
Whittier
Norco
Bloomington
Rubidoux
South Gate
Downey
Lynwood
Compton
Norwalk
La Mirada
Paramount
Buena Park
Bellflower
Brea
Yorba Linda
Placentia
Fullerton
Cypress
Lakewood
LONG BEACH
ANAHEIM
Villa Park
Orange
Garden Grove
Tustin
Westminster
SANTA ANA
Fountain Valley
Irvine
Modjeska
Trabuco Canyon
CLEVELAND
O R A N G E
M O

EIS/EIR

Las Virgenes-Triunfo
Malibu-Topanga
Area Wide Facilities Plan

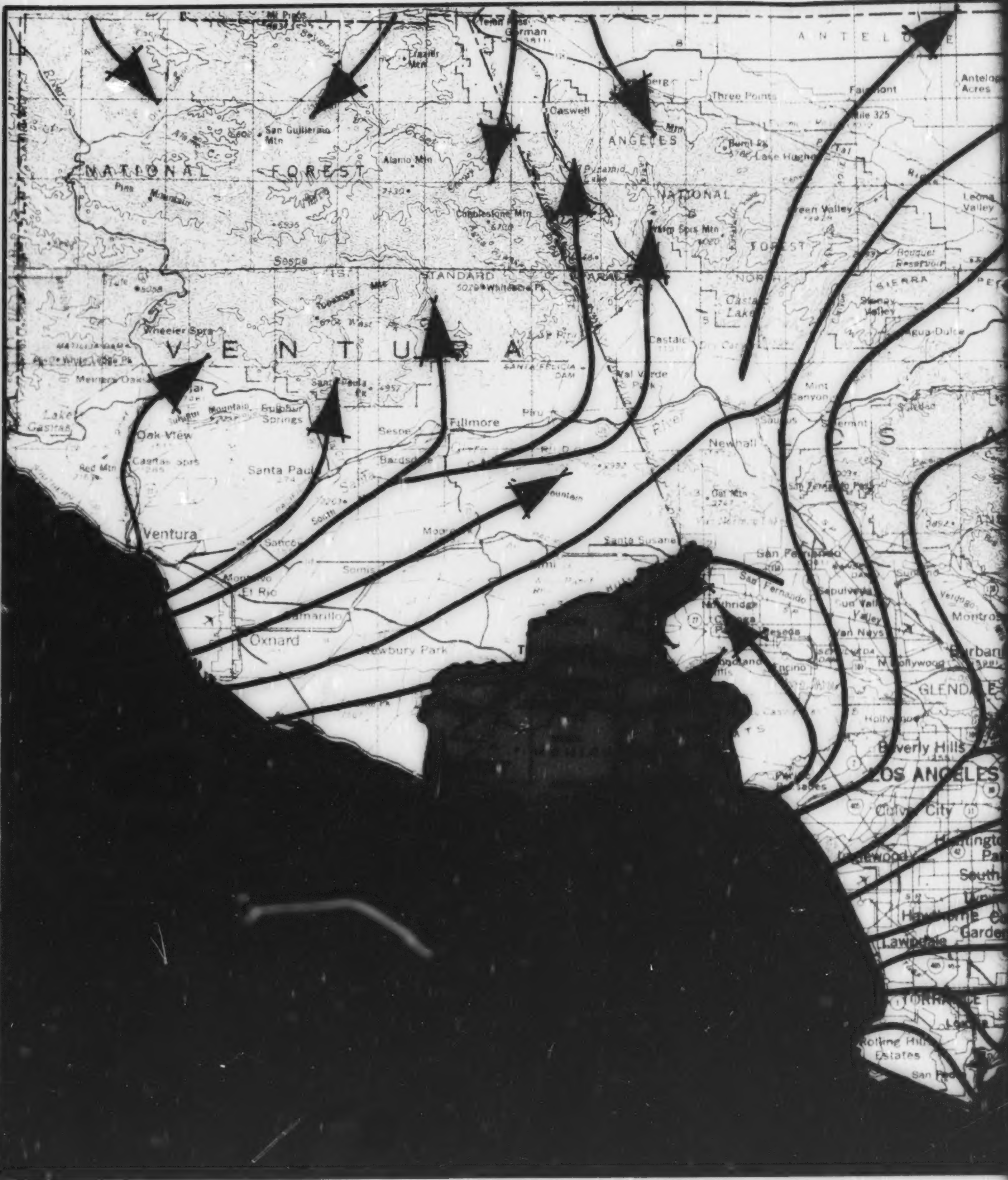
Fig. 7

North

0 2 5 10
Miles
Scale

July
Nighttime

2-9-B



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Sierra
Agua Dulce
Wheeler Sprs
VENTURA
Matilija
Meiners Oaks
Ojai
Lake Casitas
Oak View
Sulphur Springs
Santa Paula
Fillmore
Piru
Val Verde Park
Mint Canyon
Saugus
Newhall
Red Mtn
Casitas Sprs
Ventura
Saticoy
Bardsdale
Santa Clara River
Moorpark
Santa Susana
San Fernando
Montalvo
El Rio
Camarillo
Oxnard
Newbury Park
Northridge
Reseda
Sepulveda
Sun Valley
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N Hollywood
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Glendale
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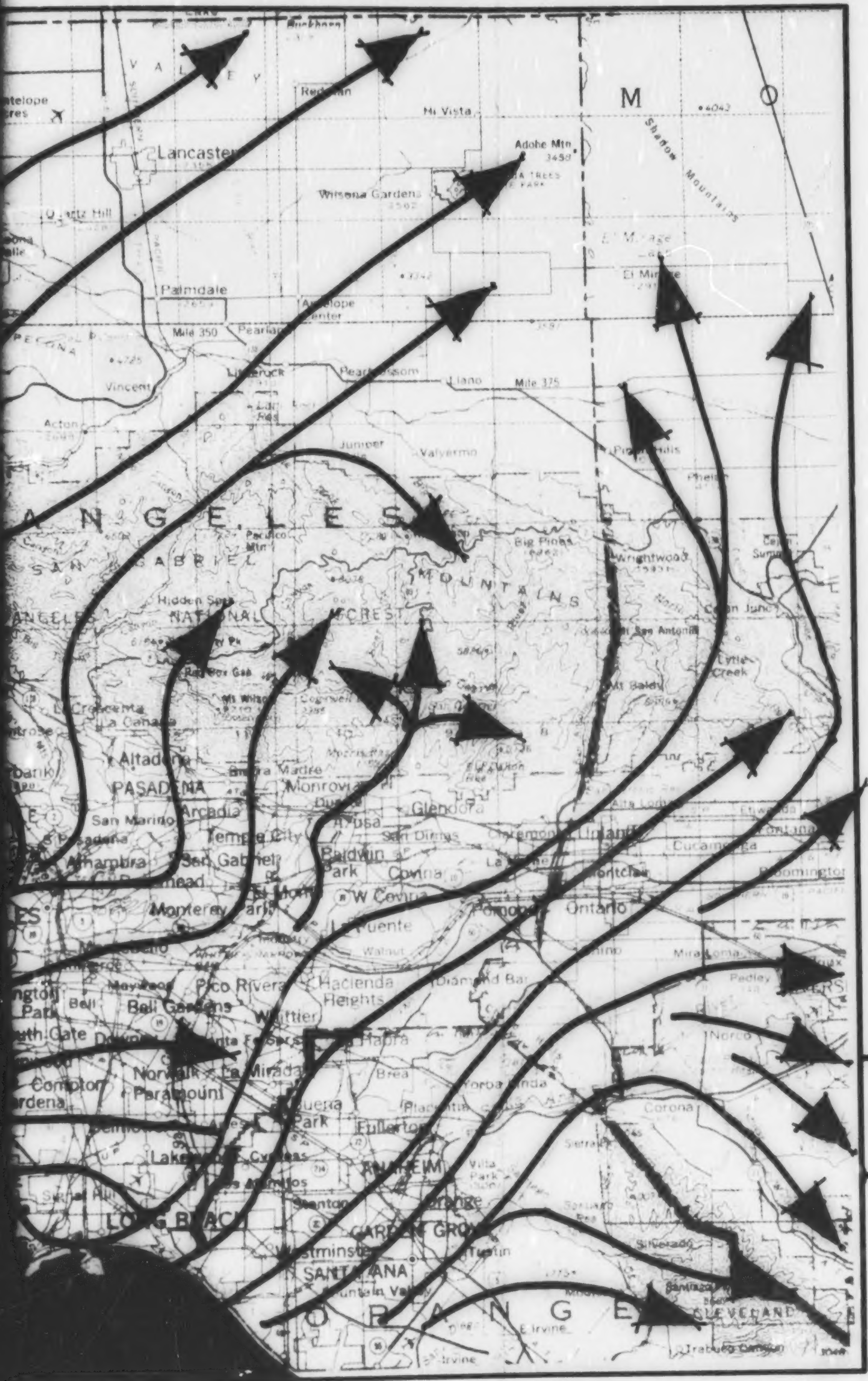
ANTELOPE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MOUNTAINS
NATIONAL
CREST
Mt San Antonio
Mt Baldy
Lytle Creek
La Crescenta
La Canada
Altadena
PASADENA
Sierra Madre
Monrovia
Arcadia
San Marino
Temple City
San Gabriel
Alhambra
Monterey Park
Rosemead
El Monte
Baldwin Park
Azusa
Glendora
San Dimas
Covina
W Covina
La Verne
Claremont
Upland
Pomona
Ontario
Montclair
Cucamonga
Fontana
Bloomington
La Puente
Walnut
Chino
Diamond Bar
Hacienda Heights
Pico Rivera
Bell Gardens
Bell
Downey
Whittier
La Habra
Brea
Yorba Linda
Santa Fe Springs
La Mirada
Norwalk
Paramount
Compton
Gardena
Buena Park
Fullerton
Placentia
Bellflower
Lakewood
Cypress
Los Alamitos
ANAHEIM
Villa Park
Orange
Stanton
GARDEN GROVE
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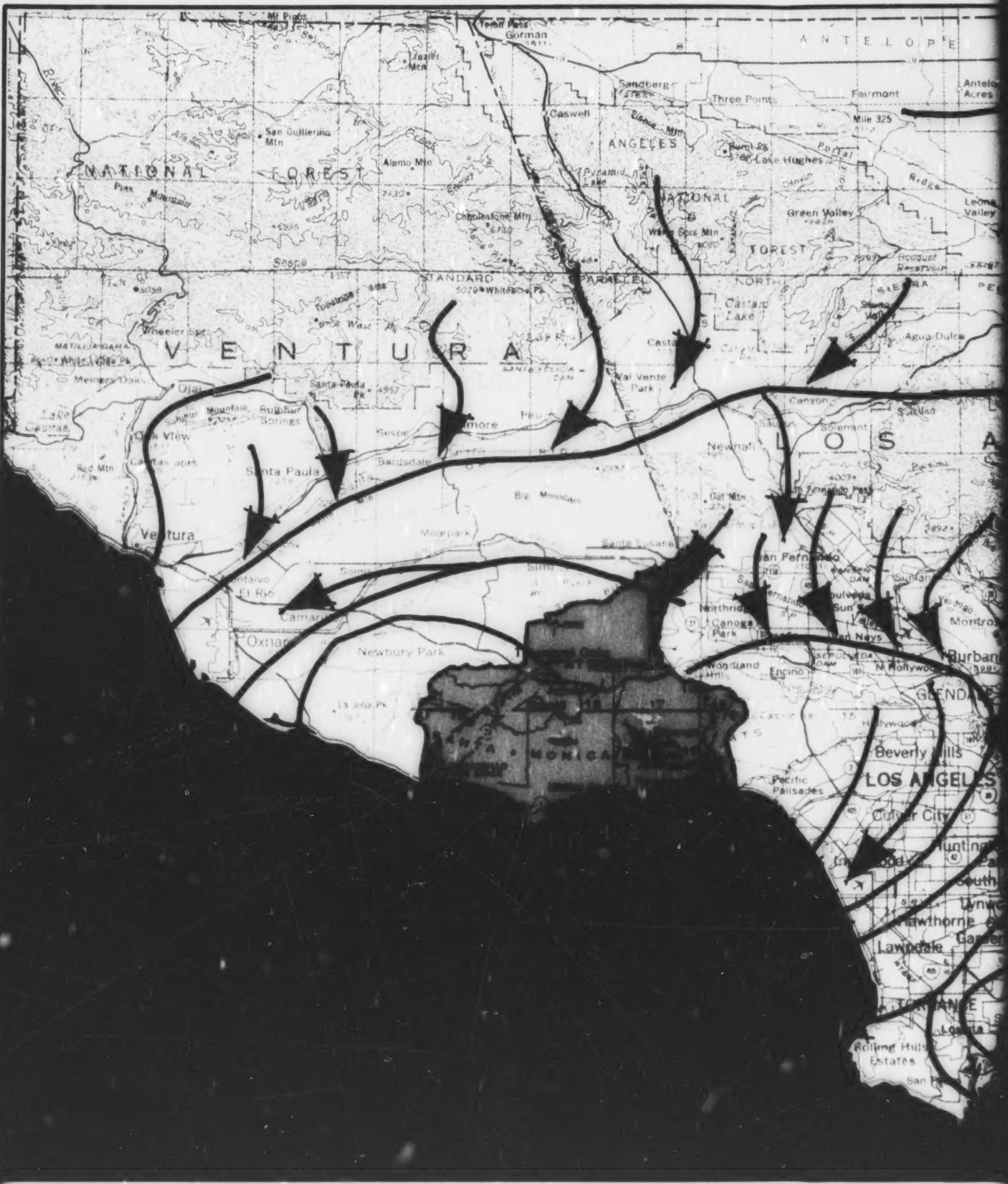
CLEVELAND
Trabuco Canyon
M O
Shadow Mountains
0 2 5 10
Miles
Scale
North

Fig. 8

October
Daytime



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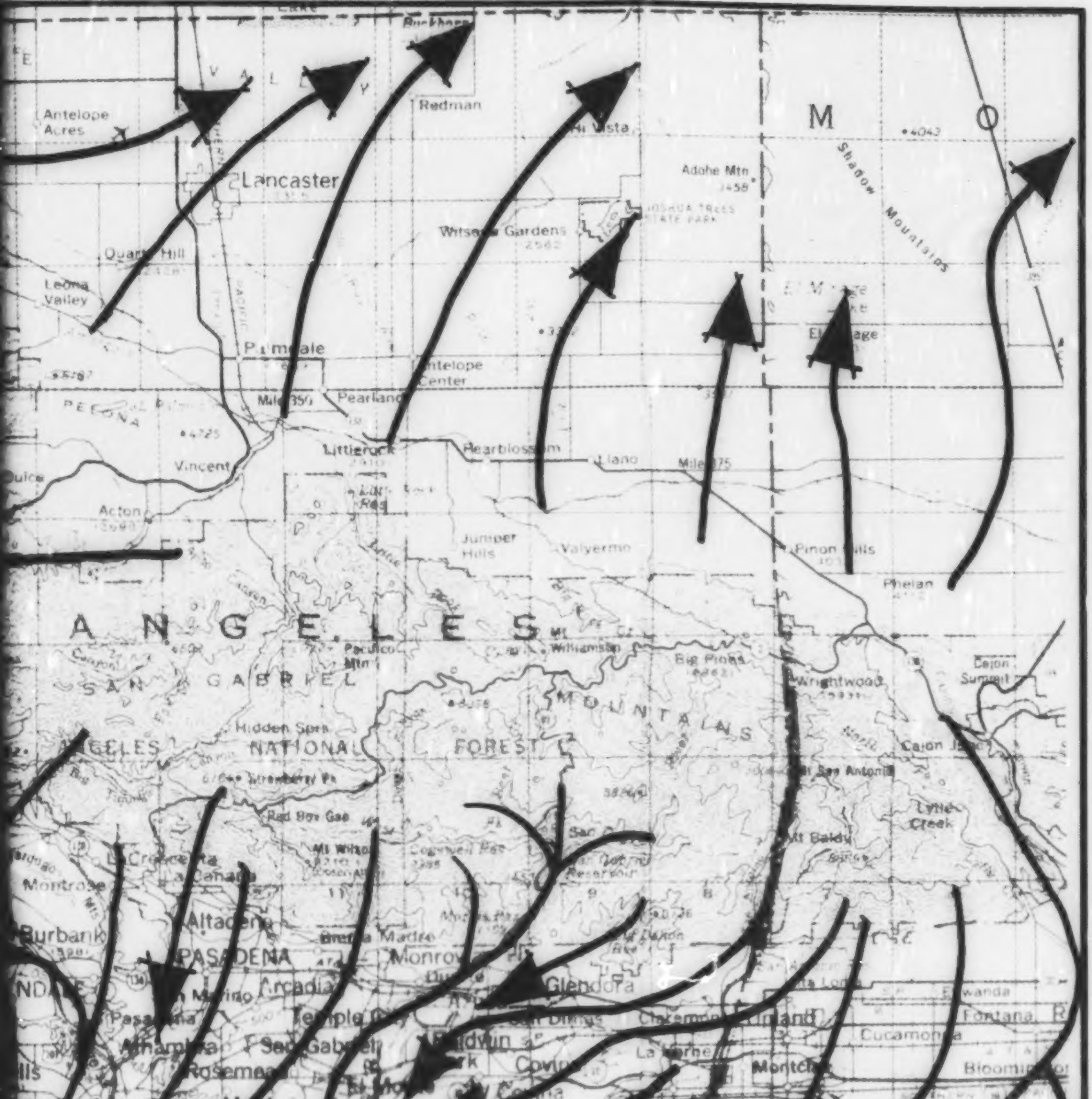
Rolling Hills Estates
San Pedro

EIS/EIR
Las Virgenes-Triunfo
Malibu-Topanga
Area Wide Facilities Plan



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Santiago Peak
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Trabuco Canyon
North
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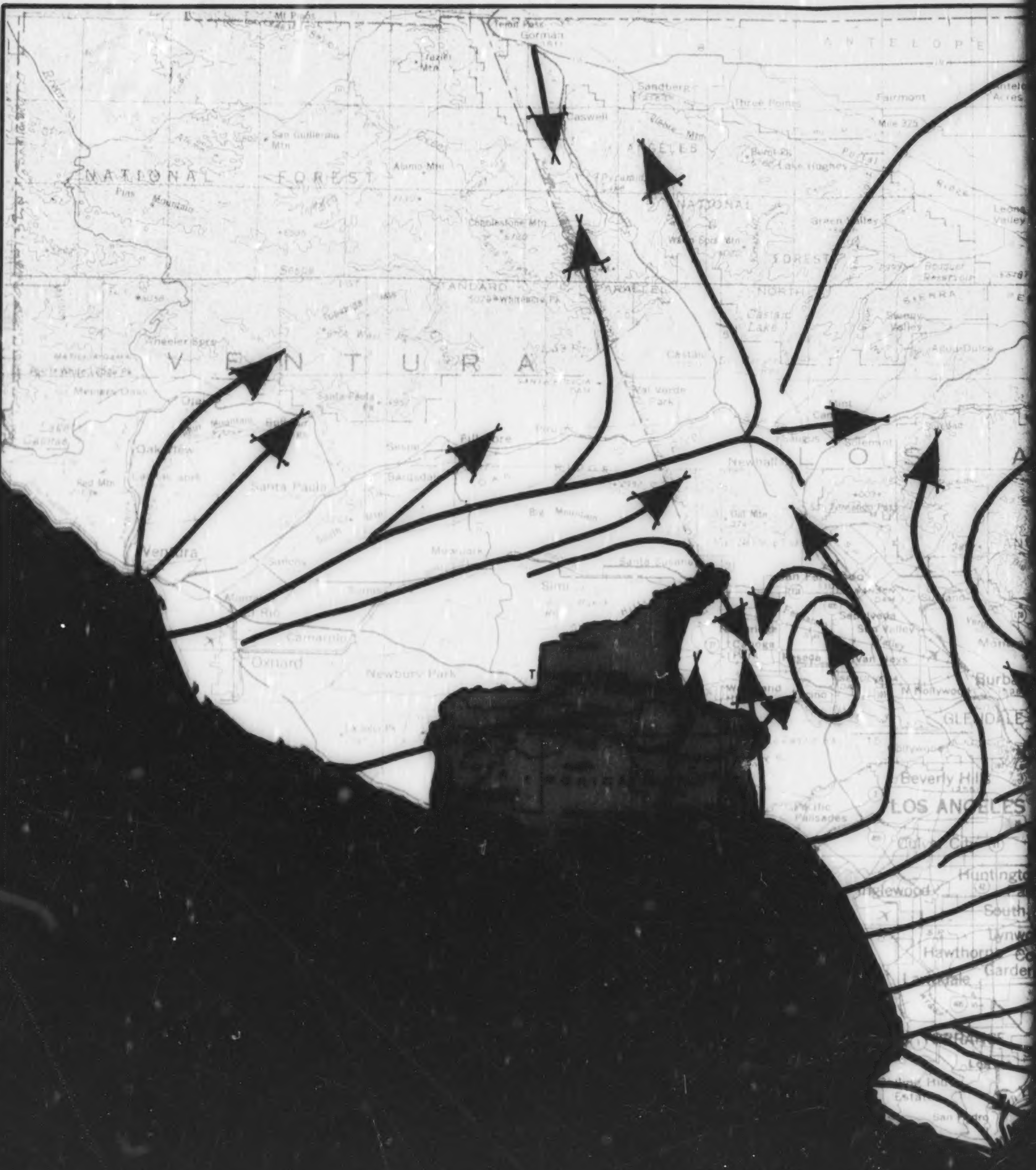
Miles
Scale

Fig. 9

October Nighttime

2-9-D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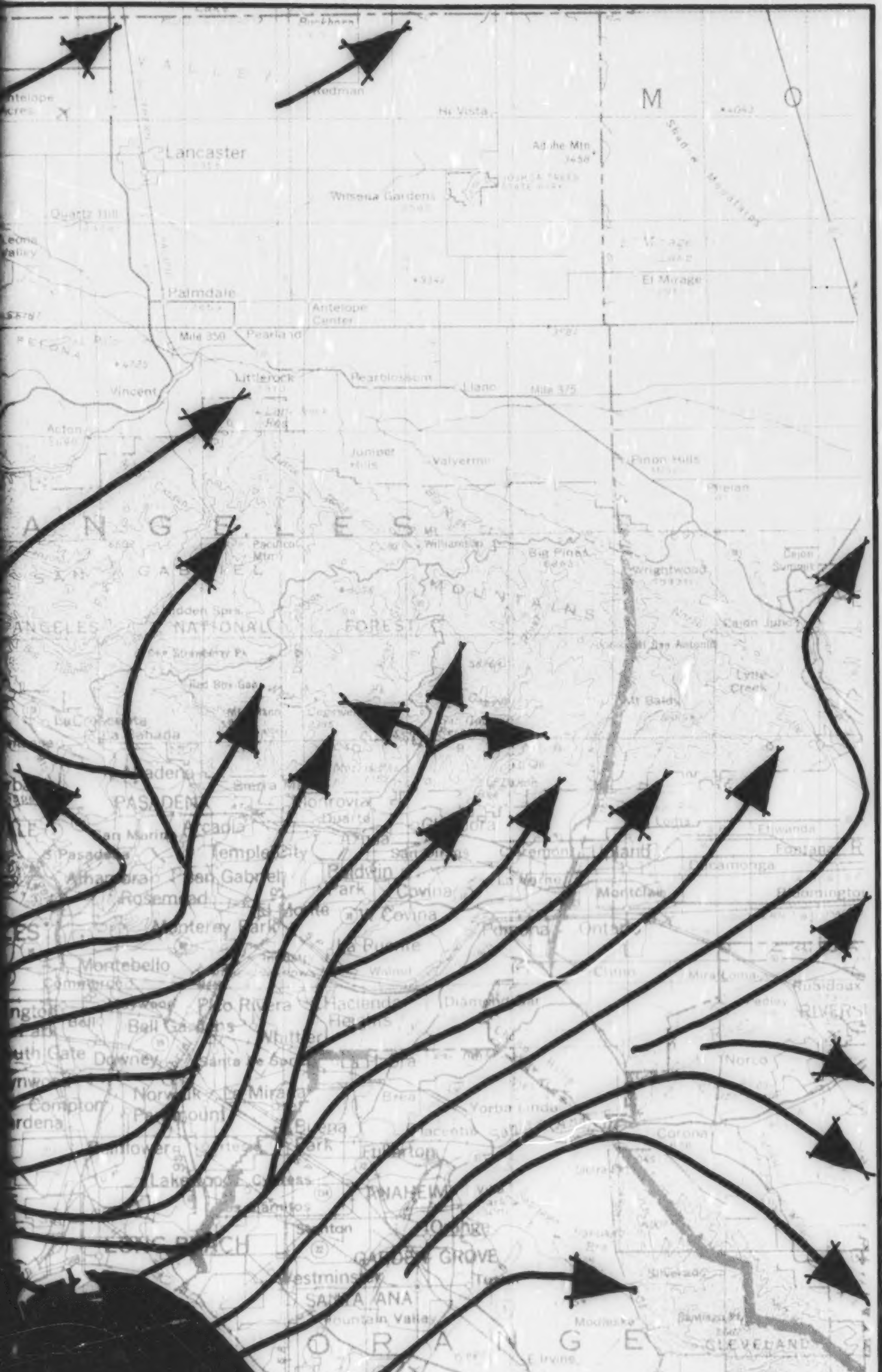
San Pedro

EIS/EIR

Las Virgenes-Triunfo
Malibu-Topanga
Area Wide Facilities Plan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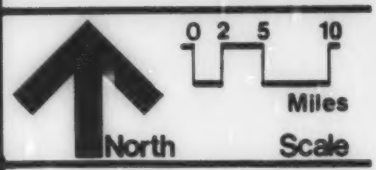
O R A N G E
CLEVELAND
Trabuco Canyon
RIVERSIDE

Fig. 10


0
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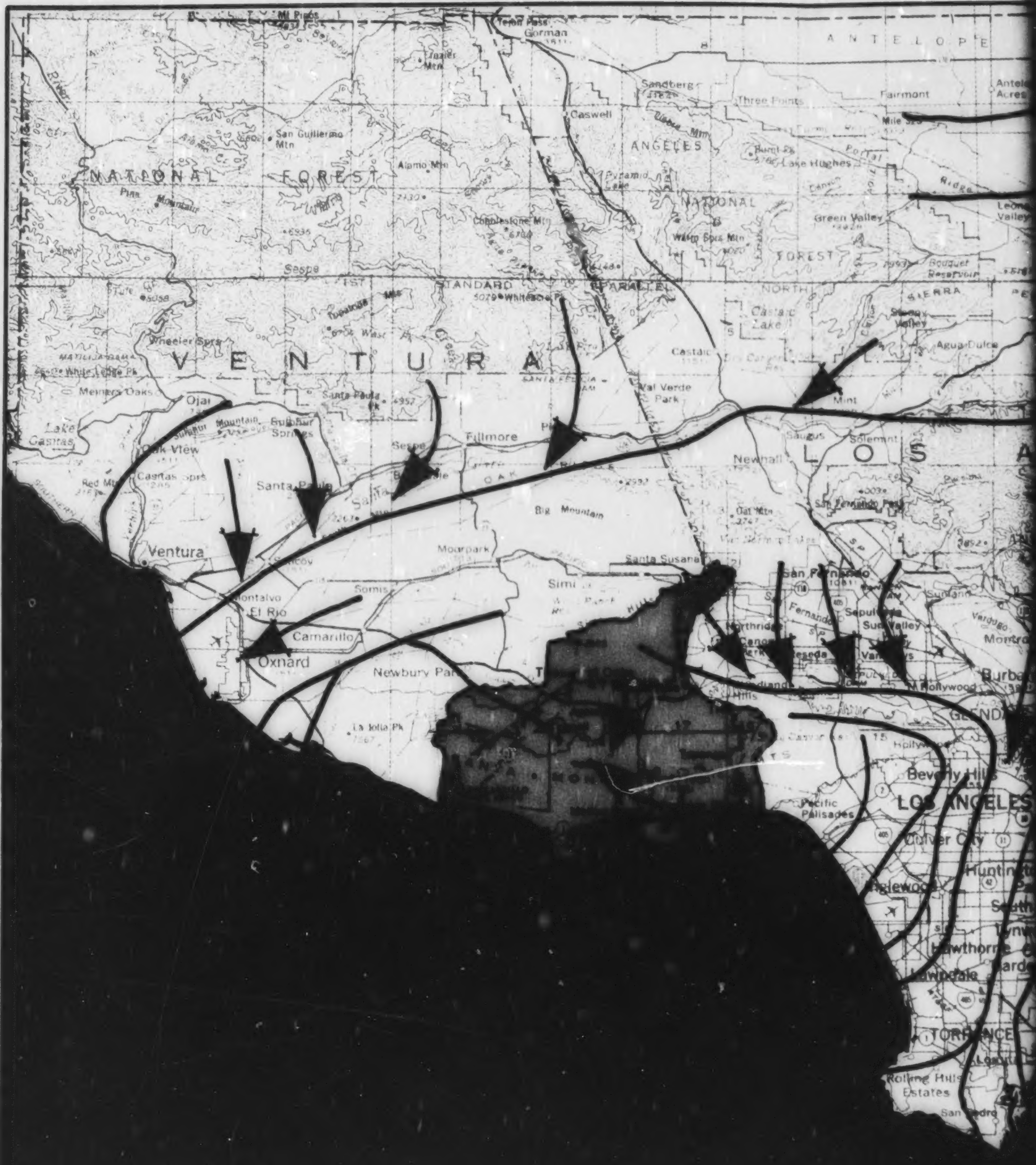
Miles
North
Scale

January
Daytime

2-9-E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Pine Mountain
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Cobblestone Mtn
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White Ledge Pk
Meiners Oaks
Ojai
Santa Paula Pk
Val Verde Park
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Sulphur Mountain
Sulphur Springs
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Santa Paula
Bardsdale
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Oat Mtn
San Fernando Pass
Ventura
Moorpark
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Sun Valley
Montrose
Camarillo
Oxnard
Newbury Park
Canoga Park
Reseda
Van Nuys
North Hollywood
Burbank
Woodland Hills
GLENDALE
La Jolla Pk
Hollywood
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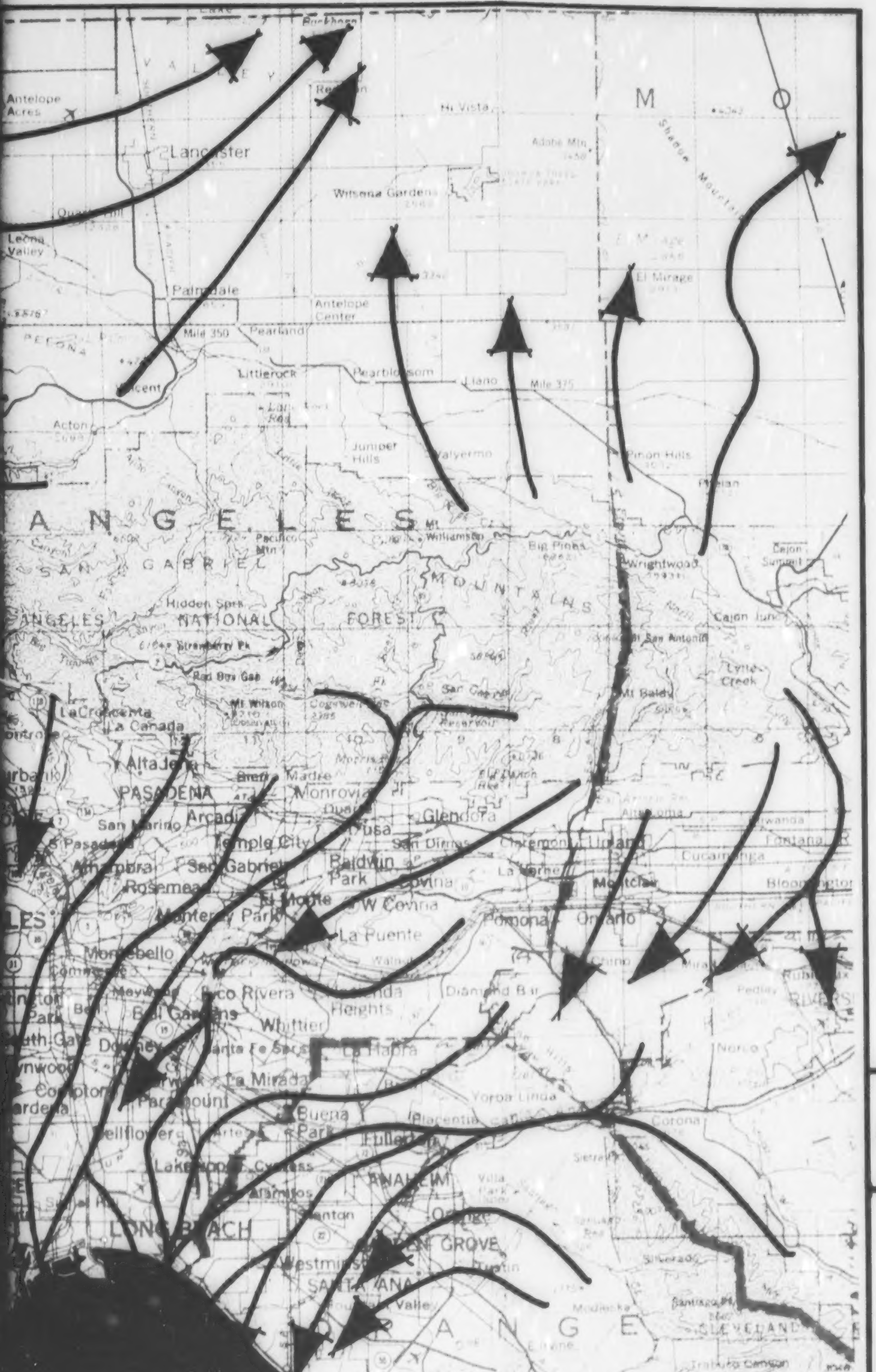
Pacific Palisades
LOS ANGELES
Culver City
Huntington
Inglewood
Hawthorne
Lawndale
TORRANCE
Rolling Hills Estates
San Pedro

EIS/EIR

Las Virgenes-Triunfo
Malibu-Topanga

Area Wide Facilities Plan



Antelope Acres
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Wilsona Gardens
Adobe Mtn
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LONG BEACH
Garden Grove
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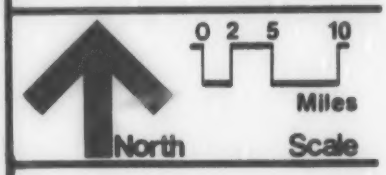
Tustin
Villa Park
Silverado
Modjeska
Santiago Pk
CLEVELAND
Trabuco Canyon
El Toro
Irvine
ORANGE
Mile 350
Mile 375

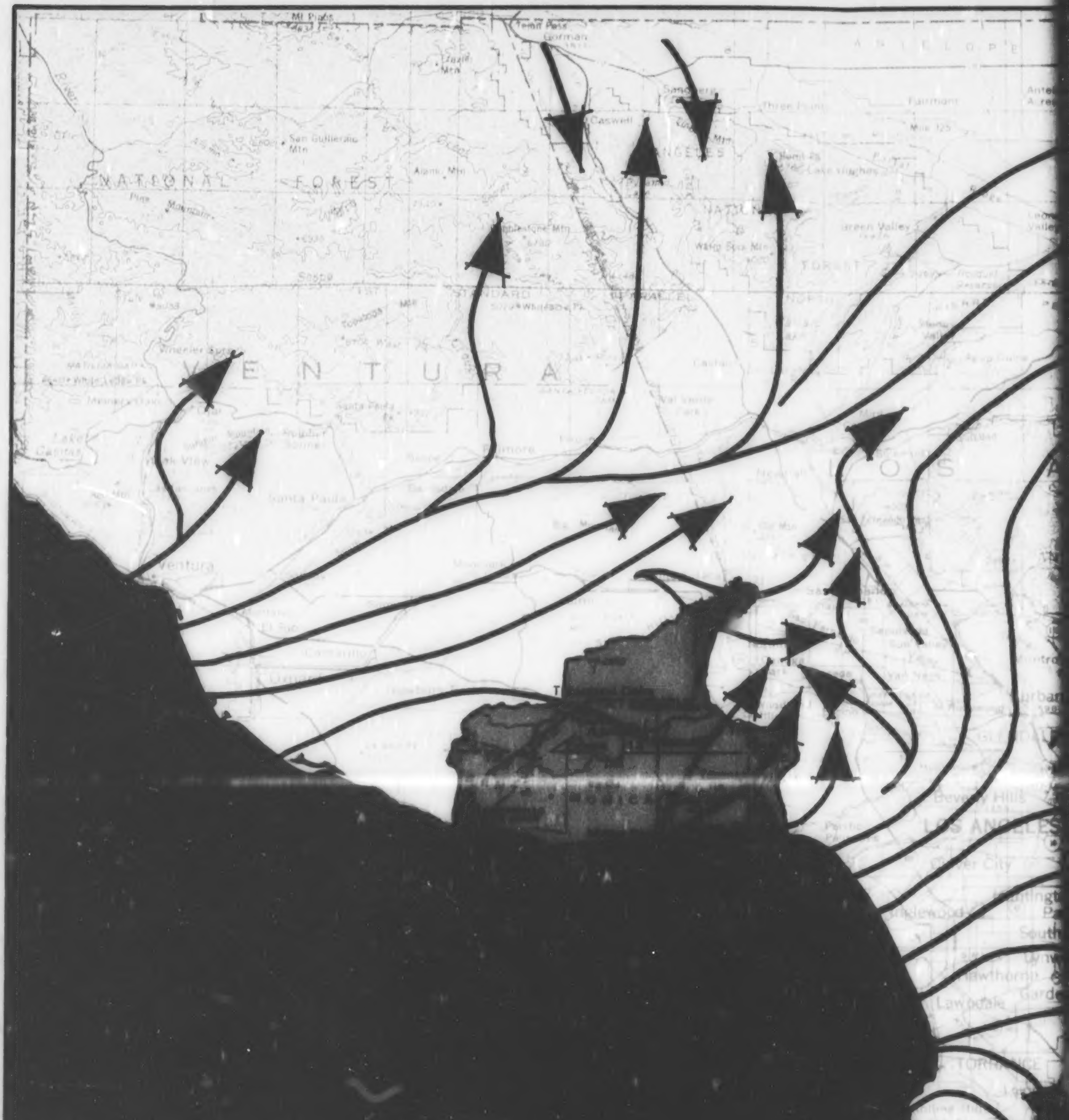
Fig. 11



0 2 5 10
Miles
North
Scale

January
Nighttime

2-9-D



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Wheeler Springs
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Lake Casitas
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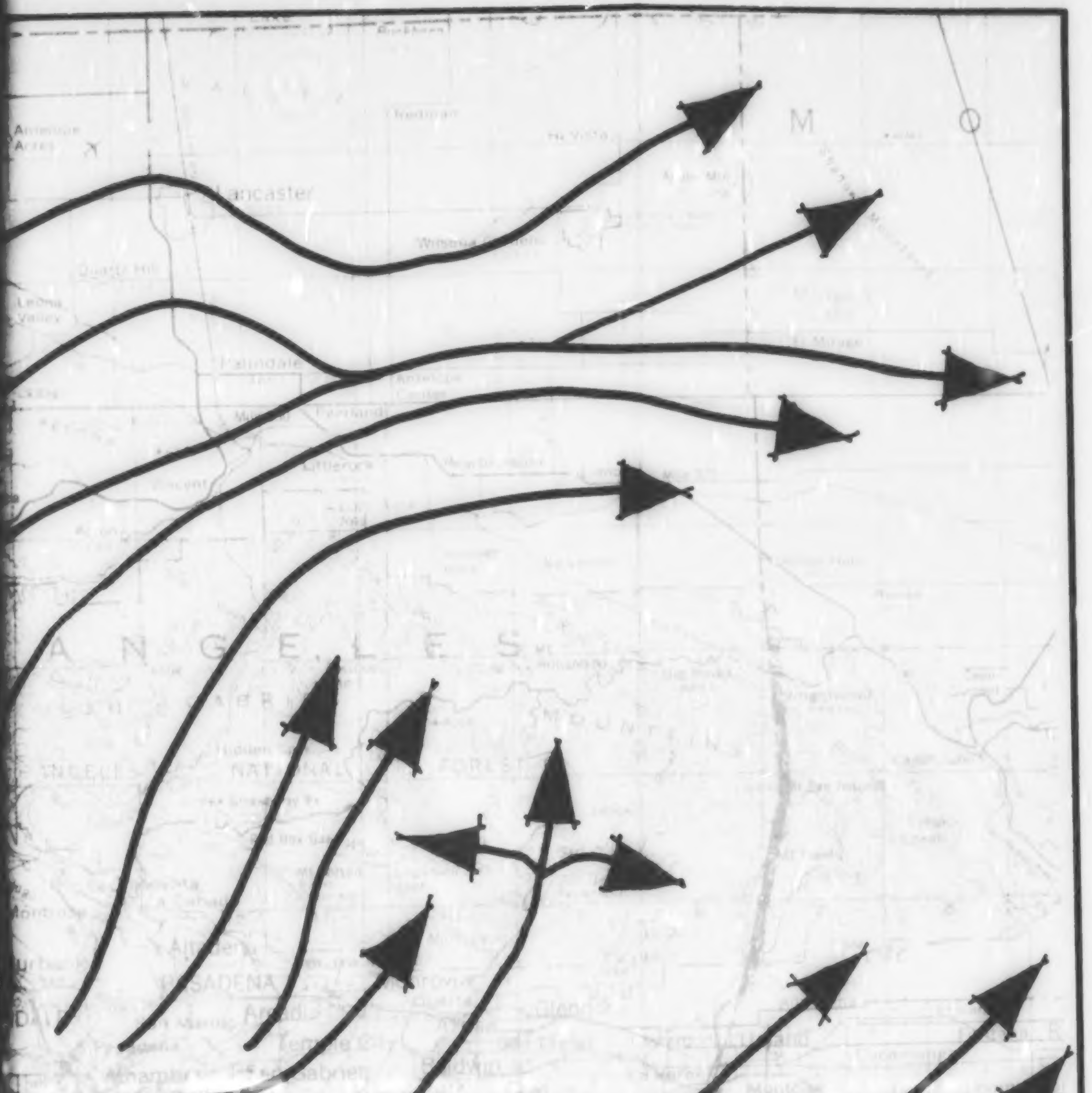
Hawthorne
Lawndale
TORRANCE
San Pedro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GARDEN GROVE
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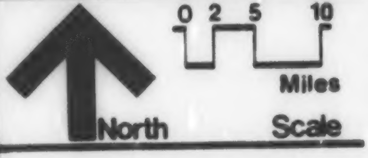
SANTA ANA
Fountain Valley
O R A N G E

EIS/EIR

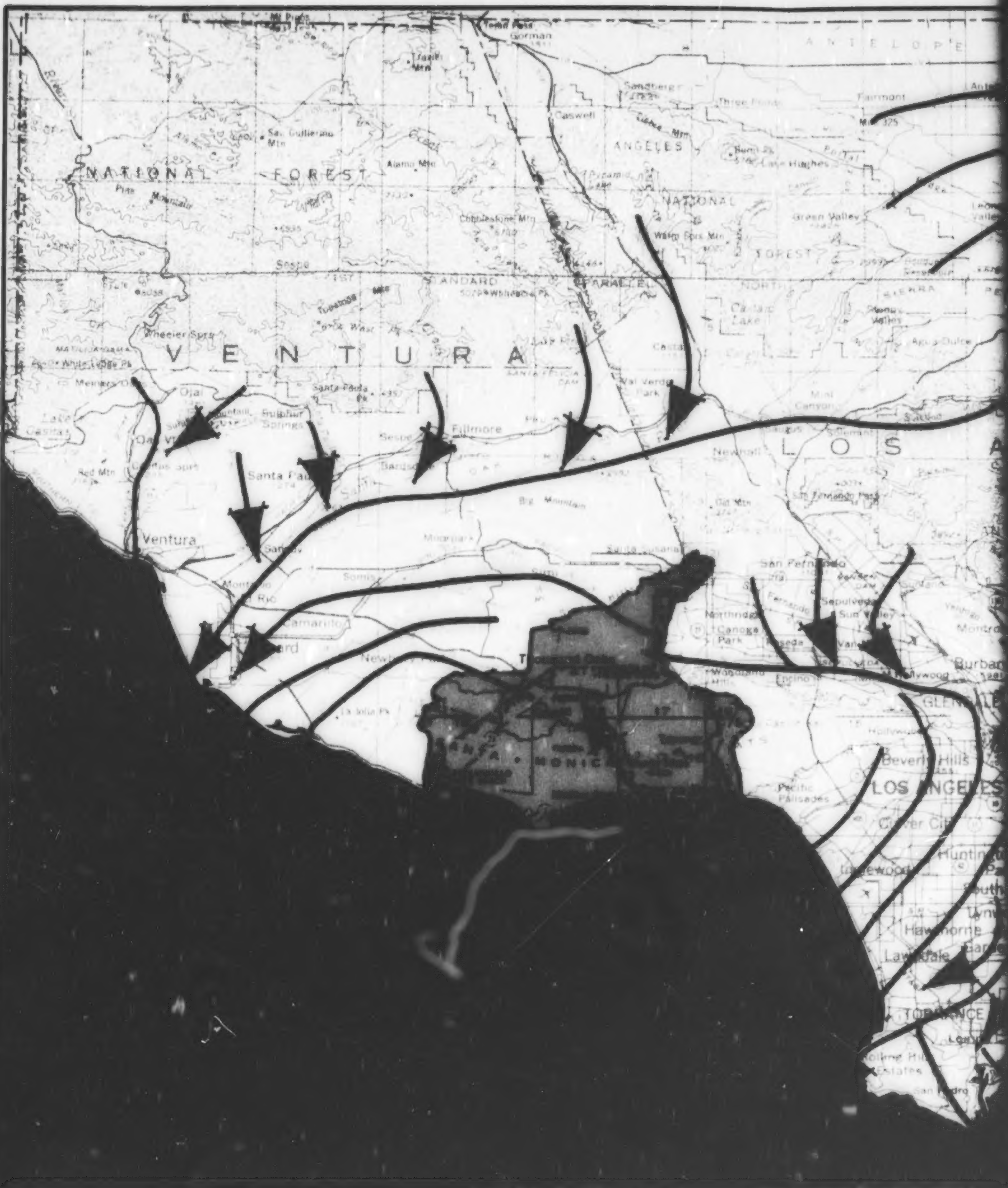
Las Virgenes-Triunfo
Malibu-Topanga
Area Wide Facilities Plan

Fig. 12


0 2 5 10
Miles
North
Scale

April
Daytime

2-9-E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Inglewood
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Lawndale
Torrance
Rolling Hills Estates
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STANDARD PARALLEL
NORTH

EIS/EIR
Las Virgenes-Triunfo
Malibu-Topanga
Area Wide Facilities Plan

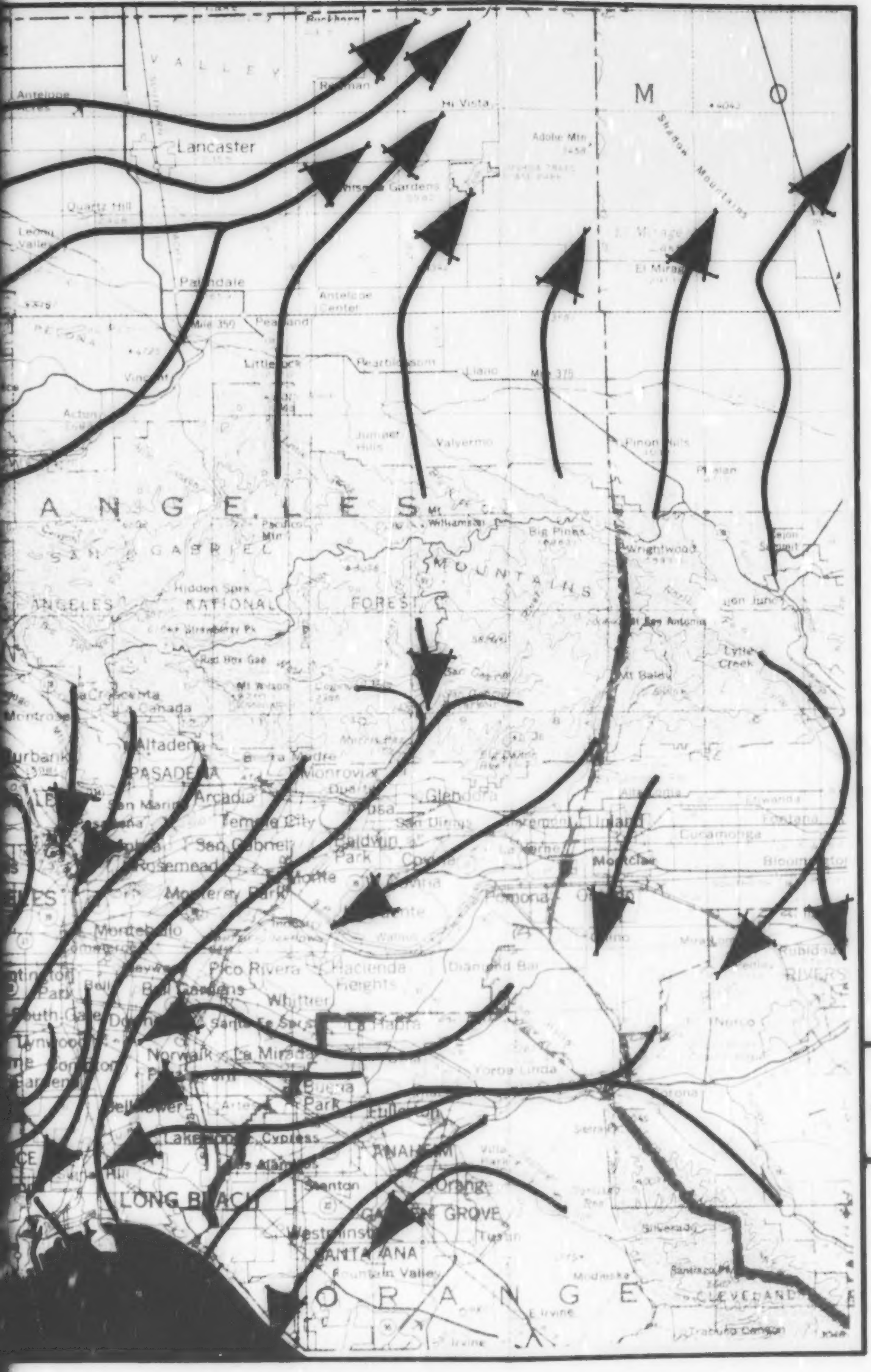
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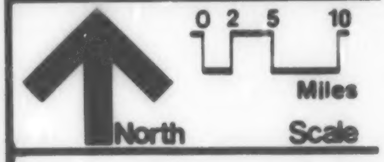
Fig. 13


0 2 5 10
Miles
North
Scale

April
Nighttime

2-9-F

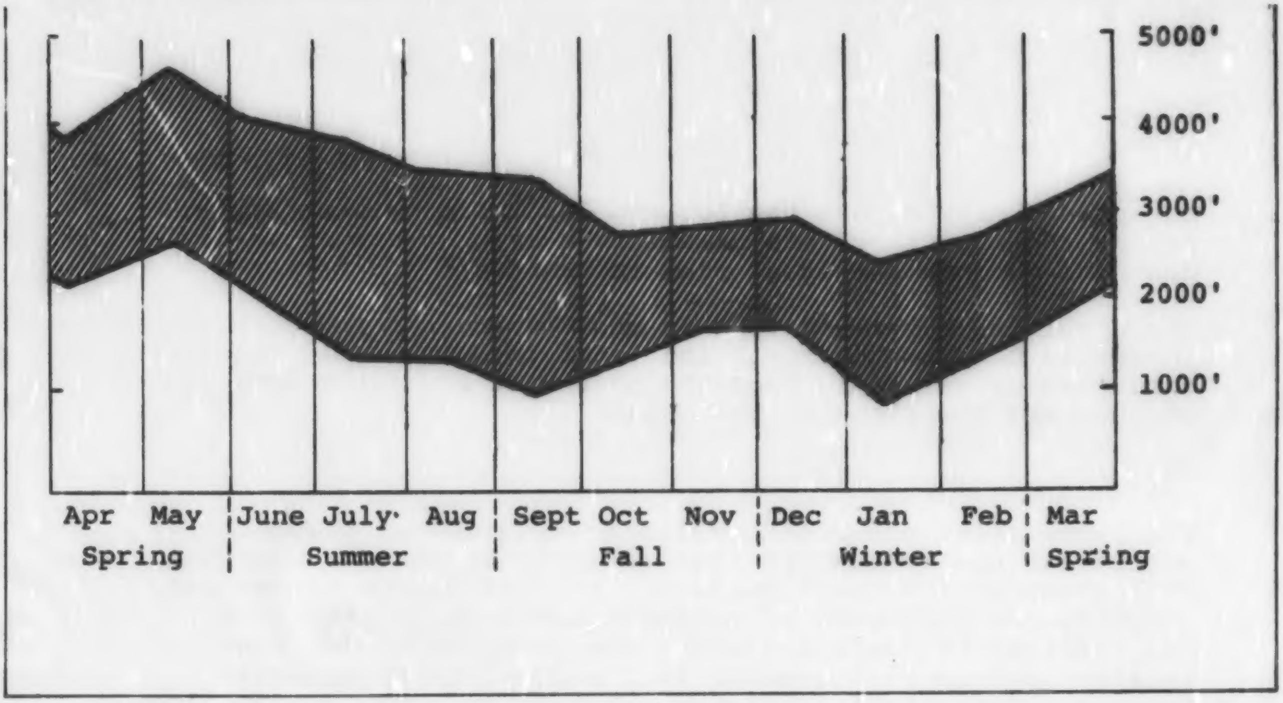
ocean generally enters the Los Angeles Basin between Santa Monica and Long Beach and passes over large areas of industrial development then moves to the north and northwest.

The nighttime oceanward flow is most pronounced in January, lesser in October and April and least in July. This nighttime flow is primarily from the northeast and flows down canyons and downslope to the ocean.

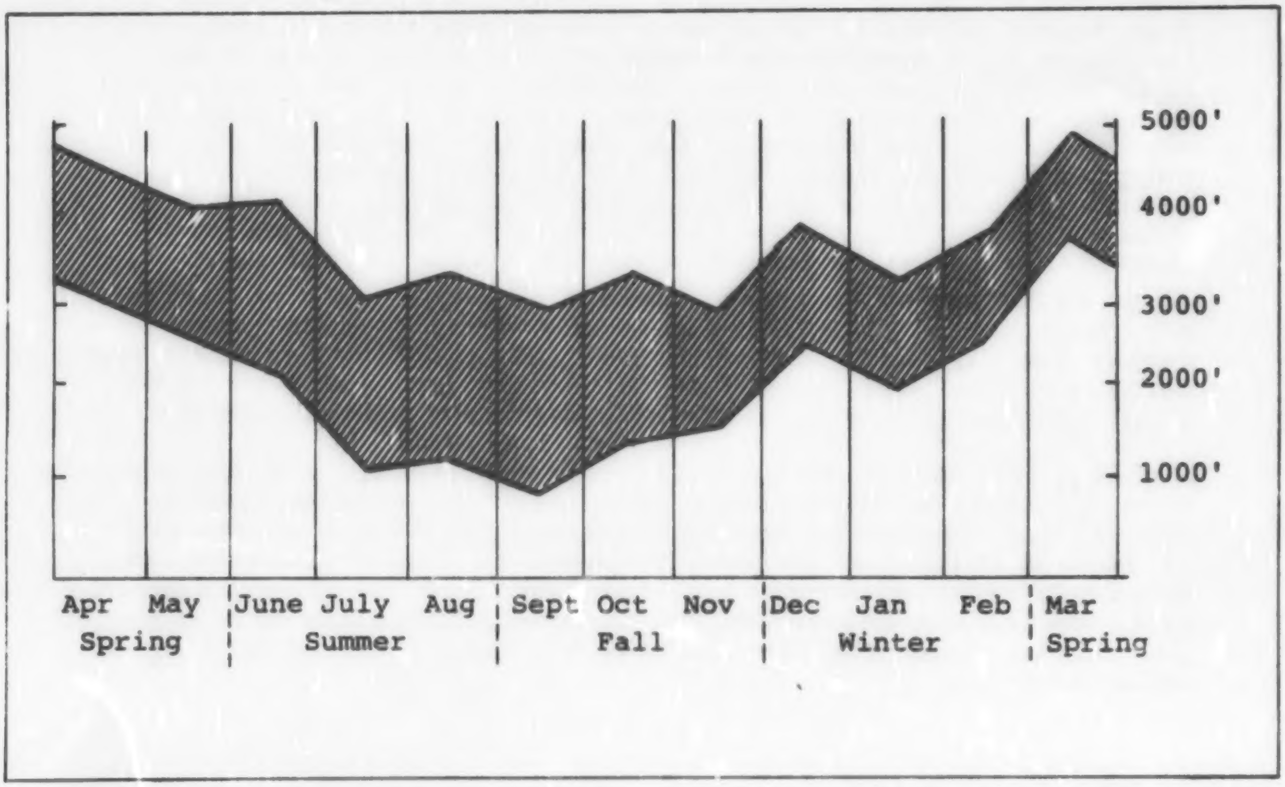
Fog

The temperature and moisture characteristics of coastal marine air are influenced significantly by various warm and cool areas of the ocean surface. In addition to effectively checking the influence of northern low pressure areas on the southern California summer, the location of the east Pacific high is instrumental in the creation of climatic factors which result in summer coastal fog. The steady flow of air from the northwest, induced by the east Pacific high during the summer months helps drive the California current of the Pacific Ocean. This current is swept southward, almost parallel to the California coastline. Because the warm water of the mean drift is slightly offshore, a band of upwelling may occur immediately off the coast. Cold water from deeper layers is drawn into the surface circulation, resulting in a semipermanent band of cold water, from 25 to 50 miles wide, just offshore. Relatively warm, moist air masses from the Pacific, drift over the band of upwelling cold water to form a bank of fog which is swept inland by the prevailing northwest winds. The air mass is generally heated as it moves inland during the late spring and early summer months. This causes the fog to lift quickly, and a deck of low clouds is formed extending inland only a short distance before evaporating completely. This layer of marine air characteristically recedes to the vicinity of the coast during the day, and extends further inland during the night and early morning. The cloud deck is usually from 1500' to 2000' deep. The air above this layer is warm, dry and cloudless.

Although the warmth of the California current and its distance from the coast stimulate cold, fog-inducing water to upwell near shore, warm water from the current itself may be trapped in various coastal embayments by prevailing northwesterly winds. Because of this phenomenon, certain areas of the coast, such as Santa Monica and Redondo Beach, have less incidence of fog and low clouds, under the same initial air mass conditions, than do other sections.



Height and Base Variations of Inversions
Averaged Over a Three Year Period
At 0400 PST
Figure 14



Height and Base Variations of Inversions
Averaged Over a Three Year Period
(June 1957-June 1962) at Santa Monica
At 1900 PST
Figure 15

Inversion

Inversion layers are a common meteorological factor that can limit the vertical mixing of air at a particular location at a particular time. A relatively low level inversion layer in relation to ground level would limit the possible vertical mixing and resulting dilution. A high level inversion layer in relation to ground level would permit a greater vertical mixing and a greater dilution. As a consequence pollutants released into the atmosphere are trapped and remain in a thin layer close to the earth's surface, rather than being diluted and eventually dispersed into much larger air masses.

As indicated by Figures 14 and 15, summer and fall are the most critical seasons for adverse inversion conditions. Whereas winter normally has a high (4000' - 5000' mean sea level) inversion condition, during spring the inversion condition is moderate at 1500' - 2000' MSL.[1] These charts were prepared from U.S. Weather Bureau data[1] for the Santa Monica Area, which is the nearest location with inversion data.

An interesting feature of inversion along the coastal mountain and valleys is an inversion which can often be lower than surrounding coastal plain areas. Because of air flow characteristics, the marine layer tends to become thinner in the afternoon. This condition is caused by inland areas heating and drawing more marine air from the coast faster than it is coming in from the ocean. The result is that this air flow attraction tends to draw marine air layers to lower heights in coastal mountain areas, creating a potential for severely low[2] inversion and higher possibility of concentrating pollutants.

Meteorological Conditions Related to Air Quality

A general rule for determining days that would have a number of meteorologic conditions which would contribute to poor air quality is known as "Rule 57" and was originally developed to control open burning. Rule 57 is used to determine when meteorologic factors can combine that would limit dispersion of pollutants. These are:

---

[1] Technical Paper 54, Meteorological Summaries Pertinent to Atmospheric Transport & Dispersion over Southern California, U. S. Weather Bureau, 1965.

[2] Discussion with California Air Resource Board, Robert McMullen.

1. Morning inversion base height is less than 1500 feet above sea level,
2. Maximum mixing height of the inversion is 3500 feet or lower, and
3. Average morning wind speed is 5 MPH or less.

Morning inversions commonly occur at about 800-1000 feet above ground level and are most persistent during the late summer and early fall. A typical inversion covers every populated area of the region and caps all major sources of air pollution emissions.

According to the Los Angeles County Air Pollution Control District, all "Rule 57" factors were realized on an average of 89 days per year over a 23-year period. This implies that on an average of almost 25% of a year, it is possible for meteorologic conditions in the Los Angeles Basin to create an environmental condition highly susceptible to air quality problems.

The pollution-concentrating effect of inversions is counteracted in coastal areas by sea breezes which are usually well developed by noon every day. These westerly winds tend to cleanse coastal areas of air pollution generated in the area, but carry it along with "old" pollution (which the typical nighttime easterly winds may have transported back over the ocean on the previous night) into the inland valleys. Photochemical reactions occur as the sea breezes move inland, causing accumulations of photochemical oxidants in the inland valleys.

During the night, weak land breezes again carry air pollution back into coastal areas and also out over the ocean.

This phenomenon tends to be a factor in visibility reduction in coastal areas in the morning. During early morning hours moisture-related sea haze is generally the cause of most visibility reduction, however, particulate remains of regional smog from the previous day may add to the effect. As the day progresses, relative humidity of the air decreases with the warming temperature and visibility reducing water droplets diminish. As this is occurring, photochemical reaction usually has begun and another form of visibility reducing smog may be produced.

2.2.3 Air Quality Setting

Introduction

There has been a long history of air pollution in the south coastal region of California and it has been recognized that the region has the poorest air quality in the state. At this time there is little evidence to indicate that the region will be able to meet federal ambient air quality standards by 1977 or by 1985 as prescribed by the Clean Air Act and its amendments.

Air quality in the region, however, varies and air pollution is less frequent and usually less severe in some areas than others. Immediate coastal areas generally have better air quality than inland areas due to factors of prevailing westerly winds, meterologic conditions and topography. The present air quality in the study area is generally considered to be better than most parts of the region, however, it is critically located within the region and its development can have effects on air quality of the region.

Pollution Sources

The most current inventory of emission sources in the total South Coast Air Quality Maintenance Area is shown in Table 2, which is from the Draft Report "Preliminary Emissions Inventory and Air Quality Forecast", April 1976, by SCAPCD CARB, and SCAG. These figures indicate that, while mobile sources (vehicular traffic, etc.) account for slightly less than two-thirds of the oxidant-forming emissions, stationary sources, at slightly more than one-third of these emissions, have acquired a greater importance than previously identified. Thus, as mobile sources are subjected to greater control, the contribution by stationary sources will acquire increased signifiance, and need for control.

Recent area-wide emission trends are described more thoroughly in pages 5-10 through 5-22.

At the present time, the most serious pollutant in the region is photochemical oxidant, so-called because it is caused by sunlight-stimulated chemical reactions between reactive hydrocarbons (RHC) and oxides of nitrogen (NO_x). The complex chain of reaction producing oxidants is dependent on the presence of RHC, NO_x, and initiation by ultraviolet radiation from sunlight and results in a mixture composed primarily of ozone and peroxyacetyl nitrate. This phenomenon occurs most frequently in late spring, summer and early fall when there is an abundance of sunlight. In order to control this secondary pollution it is thus necessary to control the precursors, the primary RHC and NO_x. Studies have shown that oxidant concentrations are more critically proportioned to RHC than to NO_x due to the nature of the photochemical reaction. The revised RHC inventory shows that reduction of RHC from stationary sources will be necessary in addition to mobile source controls.

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TABLE 2

1974
AVERAGE EMISSIONS OF POLLUTANTS

AREA : SOUTH COAST AIR QUALITY MAINTENANCE AREA

TOTAL - TONS/DAY

SOURCE	EMISSION					
	NMHC	THC	PART	NO_x	SO_2	CO
STATIONARY SOURCES						
PETROLEUM						
PRODUCTION	3.0	61.2		3.1	5.2	0.6
REFINING	47.9	47.9	3.4	18.8	78.0	1.0
MARKETING				10.3		
SUBTOTAL	205.1	263.3	3.4	32.2	83.2	1.6
ORGANIC SOLVENT USERS						
SURFACE COATING	166.6	166.6	2.1			
DRY CLEANING	28.7	28.7				
DEGREASING	38.8	38.8				
OTHER	174.7	174.7	3.7	1.5	0.6	1.4
SUBTOTAL	408.8	408.8	5.8	1.5	0.6	1.4
CHEMICAL						
METALLURGICAL	2.8	2.8	12.4	26.2	41.0	225.1
MINERAL	1.0	1.0	30.5	28.1	20.4	49.1
FOOD AND AG PROCESSING						
PESTICIDES	9.1	9.1				
WOOD PROCESSING						
COMBUSTION OF FUELS						
REFINERIES	5.4	5.4	5.7	47.9	11.2	1.0
POWER PLANTS	8.4	8.4	23.0	121.2	198.6	10.4
OTHER INDUSTRIAL	3.1	3.1	3.3	47.9	1.6	1.4
DOMESTIC AND COMMERCIAL	1.2	1.2	9.2	55.8	0.4	3.3
ORCHARD HEATERS	4.1	4.1	1.1	0.9	3.4	0.2
SUBTOTAL	22.2	22.2	42.3	273.7	205.2	16.3
WASTE BURNING						
AGRICULTURAL DEBRIS	1.9	1.9	1.1			5.1
FOREST MANAGEMENT	0.1	0.1				0.2
RANGE IMPROVEMENT						
DUMPS						
CONICAL BURNERS						
INCINERATORS	0.1	0.1	0.2	5.1	0.6	0.4
OTHER						
SUBTOTAL	2.1	2.1	1.3	5.1	0.6	5.7
TOTAL STATIONARY	651.1	709.3	95.7	366.8	361.0	299.2
MISCELLANEOUS AREA SOURCES						
WILD FIRES	15.6	15.6	11.6	0.7		50.6
STRUCTURAL FIRES	28.0	28.0	21.0	1.5		90.9
FARMING OPERATIONS			13.5			
CONSTR. AND DEMOLITION			13.1			
UNPAVED ROADS			6.3			
UTILITY EQUIP: MOWERS, ETC.	20.8	20.8	0.5	1.5		144.6
TOTAL MISCELLANEOUS AREA	64.4	64.4	66.0	3.7		286.1

TABLE 2 (continued)

1974

AVERAGE EMISSIONS OF POLLUTANTS

AREA: SOUTH COAST AIR QUALITY MAINTENANCE AREA

TOTAL
TONS PER DAY

SOURCE	EMISSION					
MOBILE SOURCES	NMHC	THC	PART	NO_x	SO_2	CO
MOTOR VEHICLES - ON ROAD						
LIGHT DUTY VEHICLE EXHAUST	392.5	413.1	82.4	634.0	19.4	6171.0
HEAVY DUTY VEHICLE EXHAUST	46.5	48.9	4.2	52.0	1.3	650.9
HEAVY DUTY DIESEL EXHAUST	19.8	19.8	9.7	196.6	14.7	121.0
MOTORCYCLE EXHAUST	22.1	23.2	0.4	0.1		62.8
EVAPORATION	194.6	194.6				
CRANKCASE						
SUBTOTAL	675.5	699.6	96.7	882.7	35.4	7005.7
JET AIRCRAFT	19.1	19.1	14.1	12.9	4.9	80.2
PISTON AIRCRAFT	13.4	13.4	2.4	4.0	0.3	131.0
RAILROADS	6.6	6.6	0.8	29.2	12.5	27.0
SHIPS						
OTHER OFF-ROAD VEHICLES	82.0	82.0	8.8	127.9	18.7	611.7
TOTAL MOBILE	796.6	820.7	122.8	1056.7	71.8	7855.6

SUMMARY

STATIONARY SOURCES	651.1	709.3	95.7	366.8	361.0	299.2
MISCELLANEOUS AREA SOURCES	64.4	64.4	66.0	3.7		286.1
MOBILE SOURCES	796.6	820.7	122.8	1056.7	71.8	7855.6
GRAND TOTAL	1512.1	1594.4	284.5	1427.2	432.8	8440.9

Source: Preliminary Emissions Inventory and Air Quality Forecast 1974-1975, Final Report of the Boundaries and Forecasting Committee to the Air Quality Maintenance Planning Policy Task Force, May 10, 1976.

Control strategy is now becoming more directed toward reducing RHC from stationary sources as well as automobile emissions since it now appears that RHC from stationary sources may be more prevalent than previously believed. These control strategies include vapor recovery at gasoline stations and controls on surface coating, dry cleaning and degreasing operations. Further automobile emission control strategy involves retrofit emission control devices, further control of evaporative emissions and reduction in vehicle miles traveled (VMT).

A pollutant that has the potential of becoming of greater concern in the region is sulfur dioxide. These are emitted primarily from stationary sources and have not been a serious problem with present controls and use of natural gas by industrial plants. However, expected shortages of natural gas and low-sulfur fuel oil may cause power plants and other industrial facilities to burn high-sulfur fuel oil thereby potentially increasing sulfur dioxide and nitrogen oxide pollution. In the presence of NO_x and certain RHC, sulfur dioxide can react photochemically to produce sulfuric acid aerosols and sulfate particles which could further reduce visibility and be a potential health problem.

Air Quality Standards

The Federal Government established a national program to achieve clean air through the Clean Air Act Amendments of 1970. In the following year the Environmental Protection Agency established National Ambient Air Quality Standards (NAAQS) for six types of pollutants of major health consequences. These standards are defined as those levels believed to be acceptable and having no long-term undesirable effects on health, aesthetic values or property. Federal primary standards are designed to protect public health and are not to be exceeded more than once per year. Federal secondary standards are designed to protect public welfare from air pollution effects on vegetation, materials, etc. and are not to be exceeded more than once per year. The hydrocarbon standards are guidelines to ensure that the oxidant standard will be met.

In California, the State Air Resources Board (ARB) has also adopted air quality standards which differ slightly from NAAQS, however, the more stringent standard for each pollutant are to apply and have precedence. The Federal and state ambient air quality standards are listed on Table 3 , along with the related health considerations used to establish the standards[1].

---

[1] The basis for NAAQS are presented in EPA Publications, Nos. AP-49, AP-50, AP-62, AP-63 and AP-84

Table 3 - Ambient Air Quality Standards Applicable in California

POLLUTANT	AVERAGING TIME	CALIFORNIA STANDARDS CONCENTRATION	FEDERAL STANDARDS		BASIS FOR PRIMARY STANDARD
			PRIMARY	SECONDARY	
Photochemical Oxidants (Corrected for NO_2)	1 Hour	0.10 ppm	0.08 ppm	Same as Primary Std.	Prevention of eye irritation and possible impairment of lung function in persons with chronic pulmonary disease.
Carbon Monoxide	12 Hours	10 ppm	-	Same as Primary Standards	Prevention of interference with oxygen transport by blood.
	8 Hours	-	9 ppm		
	1 Hour	40 ppm	35 ppm		
Nitrogen Dioxide	Annual Average	-	0.05 ppm	Same as Primary Std.	Possible health effects could occur at slightly higher dosage. Produces atmospheric discoloration
	1 Hour	0.25 ppm	-		
Sulfur Dioxide	Annual Average	-	0.03 ppm	-	Prevention of increase in chronic respiratory disease on long-term exposure.
	24 Hours	0.04 ppm	0.14 ppm	-	
	3 Hours	-	-	0.05 ppm	
	1 Hour	0.5 ppm	-	-	
Suspended Particulate Matter	Annual Geometric Mean	60 $\mu g/m^3$	75 $\mu g/m^3$	60 $\mu g/m^3$	Long continued exposure may be associated with chronic respiratory disease. Exposure to a combination of suspended particles and sulfur dioxide may produce acute illness.
	24 Hours	100 $\mu g/m^3$	260 $\mu g/m^3$	150 $\mu g/m^3$	
Lead (Particulate)	30-Day Average	1.5 $\mu g/m^3$	-	-	
Hydrogen Sulfide	1 Hour	0.03 ppm	-	-	
Hydrocarbons (Corrected for Methane)	3 Hours (6-9 a.m.)	-	0.24 ppm	Same as Primary Std.	
Visibility Reducing Particles	1 Observation	Visibility to less than 10 miles when the relative humidity is less than 70%	-	-	

ppm = parts per million
$\mu g/m^3$ = micrograms per cubic meter

Basin Air Quality

The State Air Resource Board has divided the state into eleven separate air basins, each with their own distinct meterologic and topographic characteristics. The South Coast Air Basin is one of these and is comprised of portions of Santa Barbara, Ventura, Los Angeles, San Bernardino, Riverside and Orange Counties. The fact that the South Coast Air Basin is a defined unit and that air pollution in one area of the basin can affect other portions of the basin makes it necessary that air quality is described from the perspective of the entire basin.

Past projections of air quality in the basin had predicted that previously implemented control strategies would significantly improve air quality. These strategies were primarily aimed at improving emission from auto and stationary sources with control devices. Recent studies have now indicated that these projections were optimistic.

Decreases in peak pollutant levels have occurred for most pollutants, however, emissions of certain pollutants have increased. Trends in NO_x emissions between 1965-1974 show an increase of 36% basinwide.[1] (See Figure 16) Individual increases within each county of the basin show Los Angeles County with a below-average 25% increase, Ventura County increased 42%, San Bernardino County increased 38% and Riverside County increased 69%. Figures for other basin counties were: Orange County, 89% increase; and Santa Barbara County 69% increase.

During the same time period, basinwide carbon monoxide emissions have decreased 4% with Los Angeles County showing a decrease of 13%, however, this was offset by increases of 16% in Ventura County; 28% in Orange County; 9% in Riverside County; and 1% in San Bernardino County (See Figure17). Similarly reactive hydrocarbon emissions during the same period has decreased 18% basinwide, with Los Angeles County showing a 24% decrease; Ventura County a decrease of 2%; San Bernardino County a decrease of 17%; Riverside County a decrease of 8%; Santa Barbara County a decrease of 9%; and Orange County increased by 6%. (See Figure 18).

---

1. Air Quality Trends & Control Strategies for Air Pollutants in the South Coast Air Basin, John C. Trijonis, et al, paper presented Dec., 1975, California Inst. of Technology

Figure 16
TRENDS IN NO_x EMISSIONS, 1965 - 1974

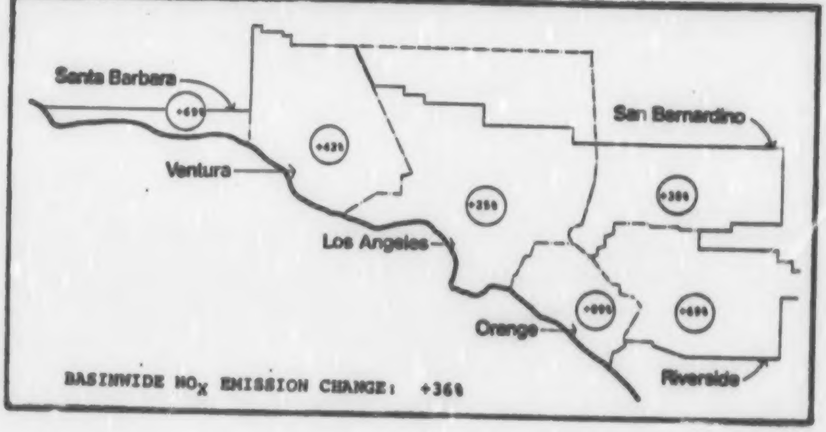

Santa Barbara
+69%
Ventura
+42%
San Bernardino
+25%
+30%
Los Angeles
Orange
+69%
+69%
Riverside
BASINWIDE NO_x EMISSION CHANGE: +36%

Figure 17
TRENDS IN CARBON MONOXIDE EMISSIONS, 1965 - 1974

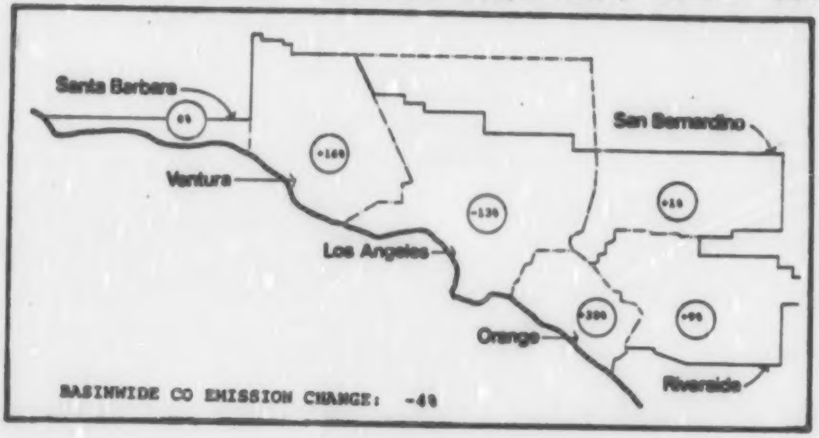

Santa Barbara
0%
Ventura
+16%
San Bernardino
-13%
+1%
Los Angeles
Orange
+30%
+9%
Riverside
BASINWIDE CO EMISSION CHANGE: -4%

Figure 18
TRENDS IN RHC EMISSIONS, 1965 - 1974

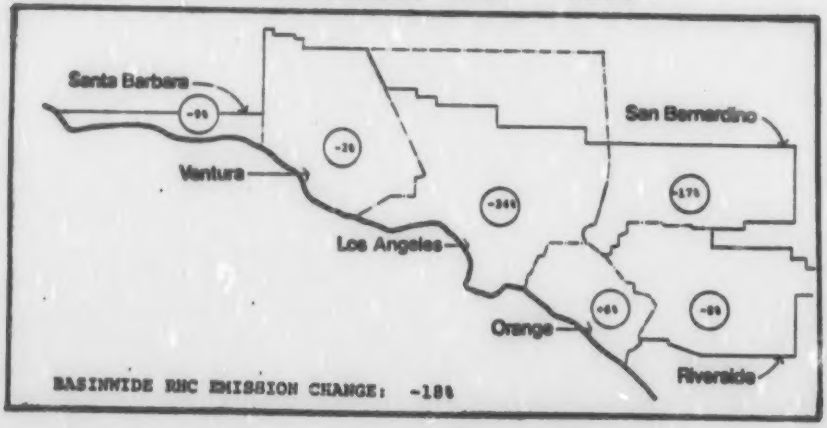

Santa Barbara
-9%
Ventura
-2%
San Bernardino
-24%
-17%
Los Angeles
Orange
+6%
-8%
Riverside
BASINWIDE RHC EMISSION CHANGE: -18%

Figure 19
AVERAGE YEARLY VMT AND POPULATION
GROWTH RATES, 1967 - 1974

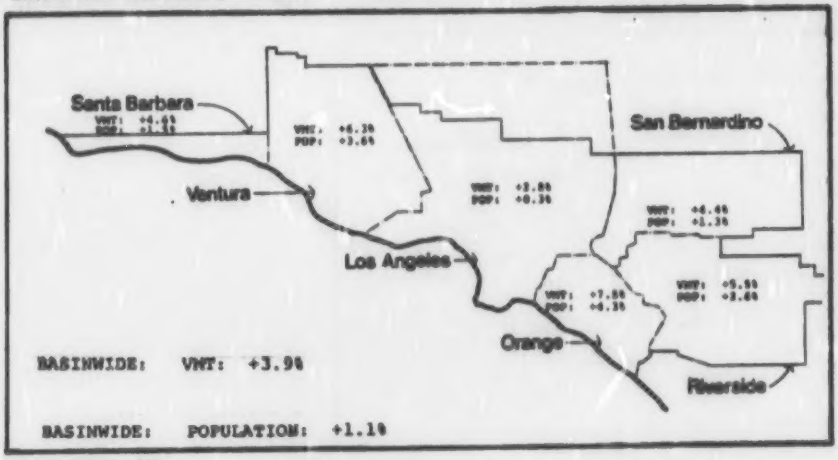
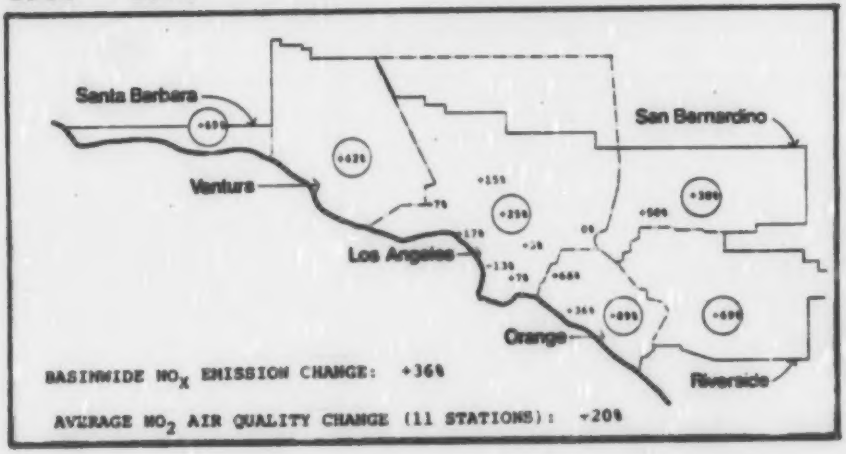

Santa Barbara
VMT: +4.6%
POP: +1.3%
VMT: +6.3%
POP: +3.6%
San Bernardino
Ventura
VMT: +2.8%
POP: +0.3%
VMT: +4.4%
POP: +1.3%
Los Angeles
VMT: +7.8%
POP: +4.3%
VMT: +5.5%
POP: +2.6%
Orange
Riverside
BASINWIDE: VMT: +3.9%
BASINWIDE: POPULATION: +1.1%

Figure 20
TRENDS IN NO_x EMISSIONS AND NO_2 AIR QUALITY
1965 - 1974


Santa Barbara
+69%
+42%
San Bernardino
Ventura
+15%
-7%
+25%
+30%
+50%
+17%
0%
+2%
Los Angeles
-13%
+7%
+60%
+36%
+89%
+69%
Orange
Riverside
BASINWIDE NO_x EMISSION CHANGE: +36%
AVERAGE NO_2 AIR QUALITY CHANGE (11 STATIONS): -20%

These figures are a result of a combination of factors such as: slowdown in overall population growth with growth shifts to counties adjacent to Los Angeles County; increases in rate of vehicle miles traveled as compared to population growth; further discoveries of emission sources and pollutants once thought not a significant part of air pollution chemistry; and deterioration of automobile emission control devices.

The major contributors to the increase in NO_x emissions were largely a result of increased vehicle miles traveled (VMT) and partially a result of increased NO_x emissions from 1966-1969 model year vehicles. The overall decrease in RHC is tempered by the 41% increase in VMT and has resulted in the net decrease of only 18%. Similarly, carbon monoxide emission decreases have been offset to a degree by VMT increases and only a net 4% decrease has been realized.[1]

The air quality of the eastern portion of the basin has been the most seriously affected in the region due to the inland transportation of pollutants by the prevailing sea breeze and the photochemical reaction that occurs during the transportation. This will probably continue to be the case, especially if NO_x emissions continue to increase.

The greater increase in NO_x emissions in the western portion of the basin may be responsible for deteriorating oxidant air quality in the eastern portion of the basin. Nitric oxide emitted in the western portion of the basin combines with ozone over the central basin, thereby lowering oxidant levels in some areas by then also producing nitrogen dioxide (NO_2) and oxygen. The NO_2 (a brown toxic gas) reacts in sunlight as it travels further inland to form, among other things, ozone - the principle oxidant component of photochemical smog. Thus, the increase in NO_x emissions help account for improvements in western and central areas of the basins but may also account for the lack of improvement in downwind eastern basin areas.[2]

In order to indicate the severity of the air pollution problem in the South Coast Air Basin, the typical yearly maximum one hour concentrations of oxidants, nitrogen dixoide and carbon monoxide during the early 1970's at seventeen monitoring sites are shown on the following maps with the federal standard for the pollutant. It can readily be seen that the federal standard has not been just slightly exceeded, but at certain times, has been greatly exceeded, indicating that in order to meet federal standards at all times, further control strategies willbe required.

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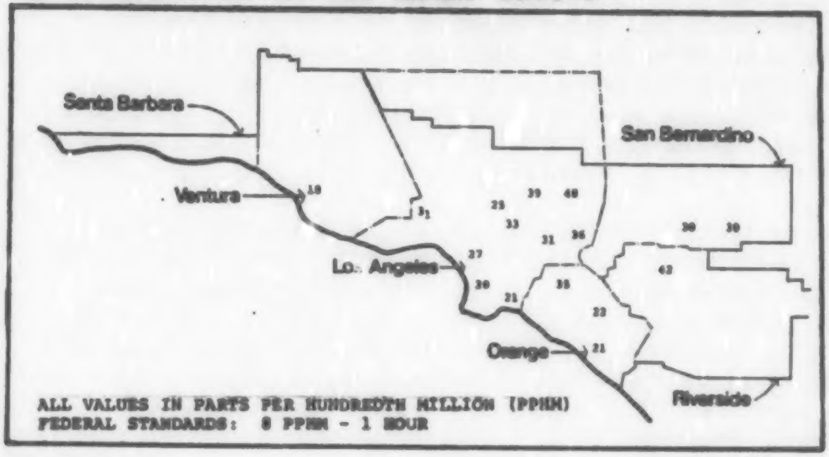
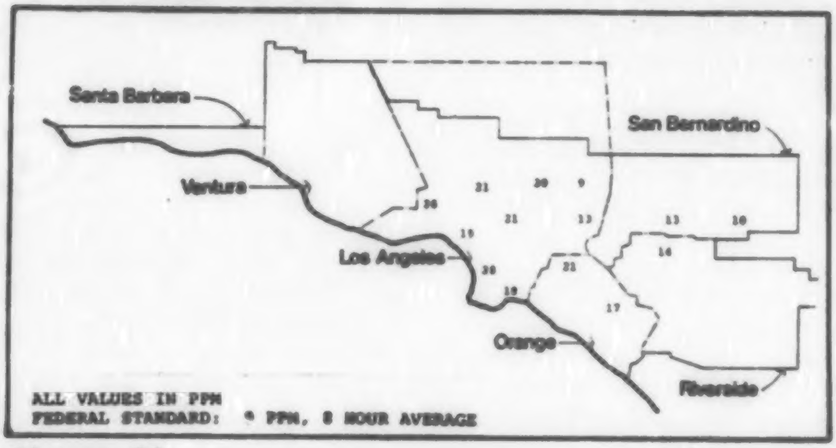
1. Air Quality Trends and Control Strategeis for Air Pollutants in the South Coast Air Basin, John C. Trijonis, et. al., Draft paper presented Dec., 1975, California Institute of Technology
2. Ibid

Figure 21
TYPICAL YEARLY MAXIMUM ONE HOUR OXIDANT CONCENTRATIONS IN THE EARLY 1970'S


Santa Barbara
San Bernardino
Ventura
10
31
25
39
40
33
31
36
30
30
27
Los Angeles
42
20
21
35
22
Orange
21
Riverside

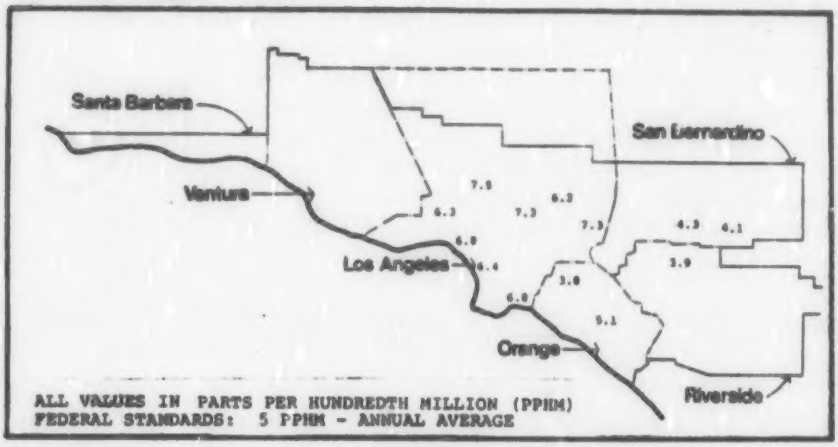
ALL VALUES IN PARTS PER HUNDREDTH MILLION (PPHM)
FEDERAL STANDARDS: 8 PPHM - 1 HOUR

Figure 22
TYPICAL MAXIMUM 8-HOUR CO CONCENTRATION IN THE EARLY 1970'S

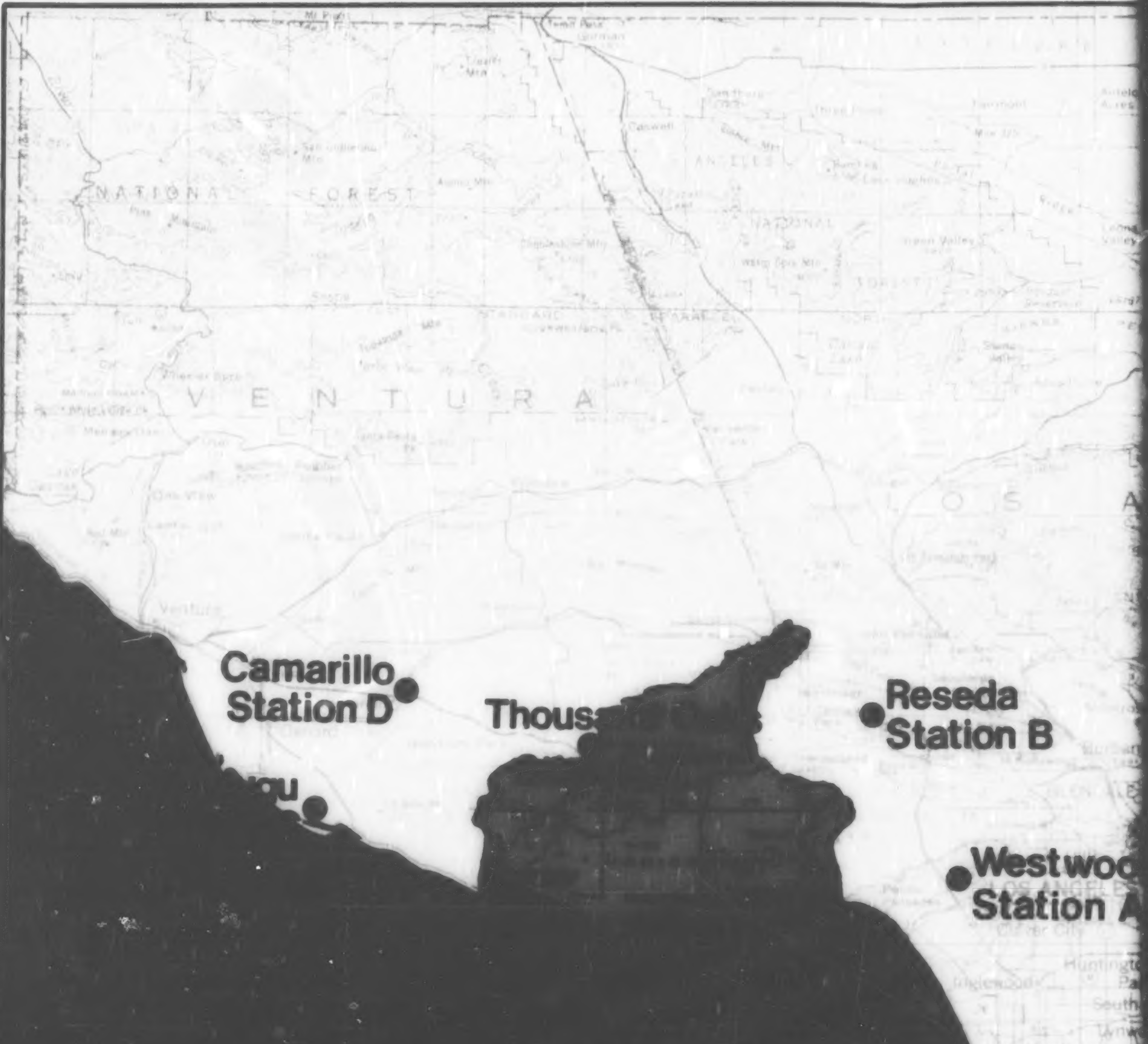

Santa Barbara
San Bernardino
Ventura
21
20
9
20
21
13
13
10
19
Los Angeles
14
20
21
19
17
Orange
Riverside

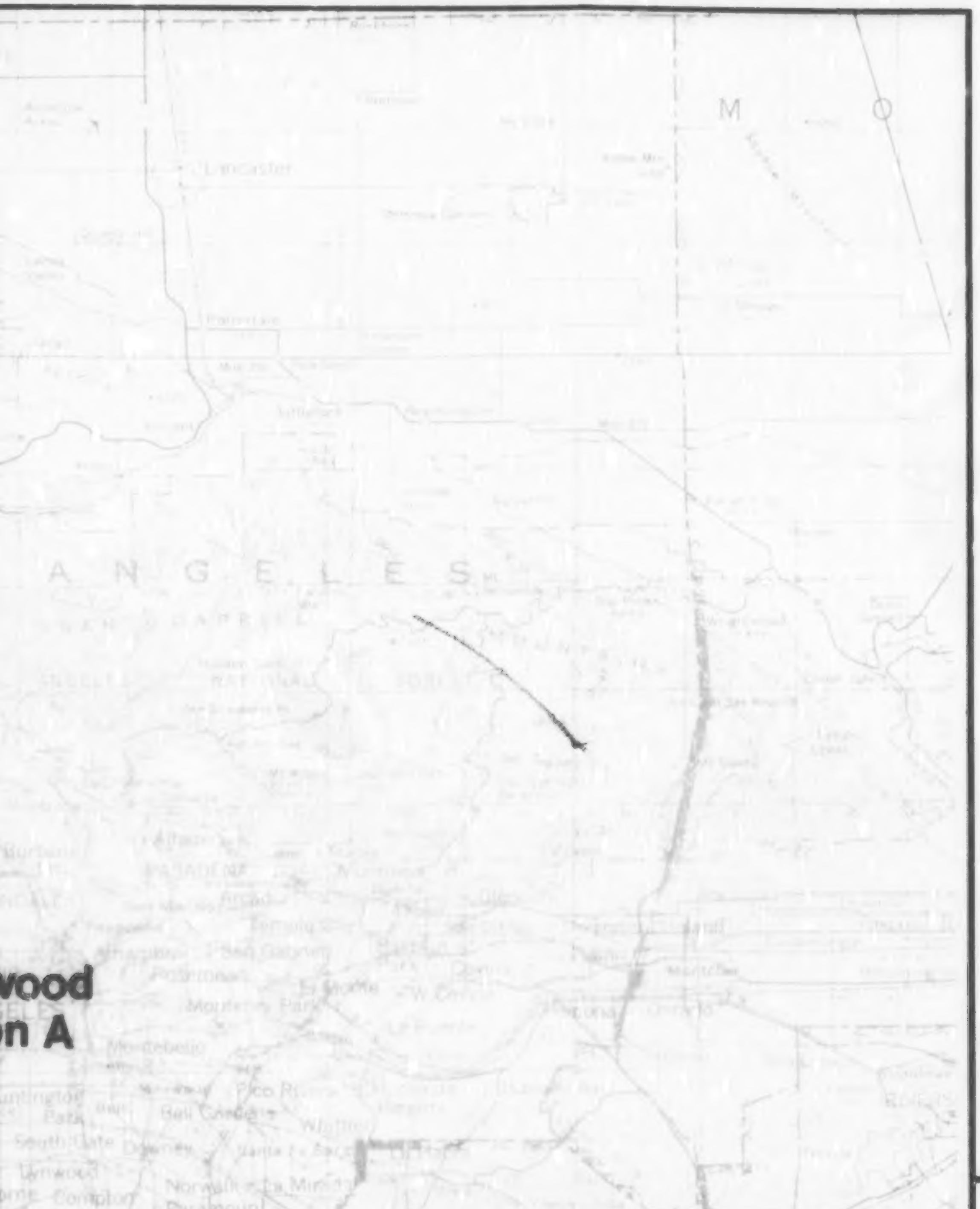
ALL VALUES IN PPM
FEDERAL STANDARD: 9 PPM, 8 HOUR AVERAGE

Figure 23
TYPICAL ANNUAL AVERAGE NO_2 CONCENTRATIONS IN THE EARLY 1970'S


Santa Barbara
San Bernardino
Ventura
7.5
6.2
6.3
7.3
7.3
4.3
4.1
6.0
Los Angeles
6.4
3.9
3.8
6.8
5.1
Orange
Riverside

ALL VALUES IN PARTS PER HUNDREDTH MILLION (PPHM)
FEDERAL STANDARDS: 5 PPHM - ANNUAL AVERAGE

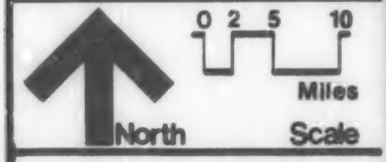

NATIONAL FOREST
VENTURA
ANGELES
NATIONAL
FOREST
LOS A
Ventura
Camarillo
Station D
Oxnard
Thousa
ou
Reseda
Station B
Westwoo
Station A
LOS ANGELES
Culver City
Inglewood
Huntington Park
Hawthorne
Lawndale
TORRANCE
Rolling Hills Estates
San Pedro


M
O
Lancaster
Palmdale
A N G E L E S
PASADENA
Monrovia
Arcadia
Temple City
San Gabriel
Rosemead
El Monte
W. Covina
Monterey Park
Montebello
Pico Rivera
Whittier
Bell Gardens
Downey
Southgate
Lynwood
Compton
Gardena
Norwalk
La Mirada
Paramount
Buena Park
Fullerton
Bellflower
Lakewood
Cypress
Los Alamitos
ANAHEIM
LONG BEACH
Stanton
Orange
GARDEN GROVE
Westminster
Tustin
SANTA ANA
Fountain Valley
O R A N G E
Irvine
Silverado
CLEVELAND
Trabuco Canyon
Pomona
Ontario
Montclair
wood
on A

EIS/EIR

Las Virgenes-Triunfo
Malibu-Topanga
Area Wide Facilities Plan

Fig. 24


North
0 2 5 10
Miles
Scale

air quality monitoring stations

2-23-A

Air Quality in the Study Area

Documenting the air quality of the primary study area is difficult due to the lack of specific data for the area. The nearest air quality monitoring stations are located at Point Mugu and Thousand Oaks in Ventura County and Westwood and Reseda in Los Angeles County. The Thousand Oaks and Point Mugu stations have not monitored all contaminants over a long period of time, however, the Camarillo station in Ventura County has kept more extensive records and is the next nearest station. The most comparable data from these stations have been utilized in this analysis. Refer to Figure 24 for the location of these stations within the regional context of the present air monitoring station network.

Discussion with officials at the Ventura County APCD indicated that the Point Mugu station generally tends to have the lowest readings in the County but that the air quality in the area begins to deteriorate when wind conditions change to a "Santa Ana" wind pattern, blowing from inland areas toward the ocean. The Camarillo station, being more inland, tends to be the recipient of air pollutants transported from coastal areas and with photochemical reactions (pollutant precursors, sunlight, etc.), and contaminants of the immediate area, readings are gererally higher than with coastal stations. Similarly, the Simi Valley area, just north of the study area, tends to have high pollutant levels and it is believed that nighttime wind flows carrying air pollution back from adjacent urban valleys to the east, combine in the morning with air pollution flowing in from the coast to produce the worst air quality in Ventura County.

The data listed for stations in Ventura County when compared to the stations in Los Angeles County show that air quality is worse in the more urban areas of Los Angeles County. It can probably be assumed that air quality with the study area falls within the range of the data shown from these stations. This data, as shown on Tables 4-8 indicates that oxidant pollution is the most critical of the various pollutants and has exceeded both federal and state standards on a significant number of days over a period of several years. The maximum high hour oxidant levels recorded at most of the stations greatly exceed the federal level.

TABLE 4 - AMBIENT AIR QUALITY AT WESTWOOD (Station A)

(Maximum Annual Concentrations and Number of Days Exceeding Ambient Air Quality Standards)

POLLUTANT	1970	1971	1972	1973	1974	1975
Oxidants						
Maximum High Hour (ppm)	.24	.26	.19	.39	.19	.19
#Days .08 ppm (Fed. Std.)	160	93	66	90	75	.65
#Days .10 ppm (State Std.)	99	62	52	62	51	.44
Carbon Monoxide						
Maximum High Hour (ppm)	33	34	34	29	35	37
#Days 9 ppm - 8 hours (Fed. Std.)	133	70	72	53	50	42
Nitrogen Dioxide						
Maximum High Hour (ppm)	.52	.60	.42	.47	.76	1.27
#Days .25 ppm - 1 hour (State Std.)	32	53	26	27	35	36
Sulfur Dioxide						
Maximum 24 hours (ppm)	.20	.11	.17	.10	.09	.04
#Days .14 ppm - 24 hours (Fed. Std.)	0	0	0	0	0	0**
Suspended Particulates						
Maximum 24 hours (ug/m^3)	262	227	177	230	190	157
Annual Geometric Mean	91	85	86	74	69	78
#Days 100 ug/m^3 (State 24 hr. Std.)	25	15	27	14	8	16

* data not available

** State standard was reduced from .1 ppm for 24 hours to .04 ppm for 24 hours on June 12, 1973. This standard was exceeded 1 day at the Westwood station.

TABLE 5 - AMBIENT AIR QUALITY AT RESEDA (Station B)

(Maximum Annual Concentrations and Number of Days Exceeding Ambient Air Quality Standards)

POLLUTANT	1970	1971	1972	1973	1974	1975
Oxidants						
Maximum High Hour (ppm)	.37	.32	.29	.28	.28	.30
#Days .08 ppm (Fed. Std.)	211	167	157	160	175	182
#Days .10 ppm (State Std.)	174	153	136	142	155	171
Carbon Monoxide						
Maximum High Hour (ppm)	54	37	37	36	31	33
#Days 9 ppm - 8 hours (Fed. Std.)	154	114	98	71	64	63
Nitrogen Dioxide						
Maximum High Hour (ppm)	.39	.38	.42	.37	.30	.33
#Days .25 ppm - 1 hour (State Std.)	22	24	22	10	8	17
Sulfur Dioxide						
Maximum 24 hours (ppm)	.05	.08	.05	.07	.07	.04
#Days .14 ppm - 24 hours (Fed. Std.)	0	0	0	0	0	0**
Suspended Particulates						
Maximum 24 hours (ug/m^3)	312	450	350	556	207	207
Annual Geometric Mean	112	115	143	103	84	91
#Days 100 ug/m^3 (State 24 hr. Std.)	32	34	57	43	26	29

* data not available

TABLE 6 - AMBIENT AIR QUALITY AT POINT MUGU (Station C)

(Maximum Annual Concentrations and Number of Days Exceeding Ambient Air Quality Standards)

POLLUTANT	1971	1972	1973	1974	1975
Oxidants					
Maximum High Hour (ppm)	*	*	*	.10	.16
#Days .08 ppm (Fed. Std.)				13	22
#Days .10 ppm (State Std.)				3	7
Carbon Monoxide					
Maximum High Hour (ppm)	*	*	*	*	*
#Days 9 ppm - 8 hours (Fed. Std.)					
Nitrogen Dioxide					
Maximum High Hour (ppm)	.16**	.27	.33	.37***	.08****
#Days .25 ppm - 1 hour (State Std.)	0	2	3	1	0
Sulfur Dioxide					
Maximum 24 hours (ppm)	*	*	*	*	*
#Days .14 ppm - 24 hours (Fed. Std.)					
Suspended Particulates					
Maximum 24 hours (ug/m^3)	*	*	144.0	153.4	102.9
Annual Geometric Mean			64.15	69.40	61.94
#Days 100 ug/m^3 (State 24 hr. Std.)			3	5	1

* data not available

** Point Mugu NO_2 begins in June, 1971

*** 3 months missing in 1974

**** 2 months missing in 1975

TABLE 7 - AMBIENT AIR QUALITY AT CAMARILLO (Station D)

(Maximum Annual Concentrations and Number of Days Exceeding Ambient Air Quality Standards)

POLLUTANT	1970	1971	1972	1973	1974	1975
Oxidants						
Maximum High Hour (ppm)	.21	.17	.14	.23	.23	.18
#Days .08 ppm (Fed. Std.)	104	39	42	110	80	32
#Days .10 ppm (State Std.)	65	31	18	73	49	15
Carbon Monoxide						
Maximum High Hour (ppm)	12	14	11	9	10	14
#Days 9 ppm - 8 hours (Fed. Std.)	0	0	0	0	0	0
Nitrogen Dioxide						
Maximum High Hour (ppm)	.20	.17	.22	.18	.22	.18
#Days .25 ppm - 1 hour (State Std.)	0	0	0	0	0	0
Sulfur Dioxide						
Maximum 24 hours (ppm)	*	*	*	.04	.04	.04
#Days .14 ppm - 24 hours (Fed. Std.)				0	0	0
Suspended Particulates						
Maximum 24 hours (ug/m^3)	*	206.5**	207.0	193.1	168.4	132.4
Annual Geometric Mean		96.28	81.16	87.87	83.11	81.75
#Days 100 ug/m^3 (State 24 hr. Std.)		14	16	22	17	15

* data not available

** 1971 Particulate data includes only May - December

TABLE 8 - AMBIENT AIR QUALITY AT THOUSAND OAKS (Station E)

(Maximum Annual Concentrations and Number of Days Exceeding Ambient AirQuality Standards)

POLLUTANT	1971	1972	1973	1974	1975
Oxidants					
Maximum High Hour (ppm)	*	*	.19	.16	.15
#Days .08 ppm (Fed. Std.)			104	102	79
#Days .10 ppm (State Std.)			85	60	46
Carbon Monoxide					
Maximum High Hour (ppm)	*	*	*	*	*
#Days 9 ppm - 8 hours (Fed. Std.)					
Nitrogen Dioxide					
Maximum High Hour (ppm)	*	*	*	*	*
#Days .25 ppm - 1 hour (State Std.)					
Sulfur Dioxide					
Maximum 24 hours (ppm)	*	*	*	*	*
#Days .14 ppm - 24 hours (Fed. Std.)					
Suspended Particulates					
Maximum 24 hours (ug/m^3)	*	*	232.5**	170.6	174.6
Annual Geometric Mean			95.69	79.36	88.97
#Days 100 ug/m^3 (State 24 hr. Std.)			16	15	21

* data not available

** T.O. Particulate date for 1973 is only months May - December

Governmental Policy and Control Agencies

Southern California Air Quality Maintenance District

The SCAQMD is an association of previously independent County air pollution control districts which was founded in 1976. Included within this organization were the APCDs of Los Angeles County, Orange County, Riverside County and San Bernardino County. The Ventura County and Santa Barbara APCDs are not members. The agency is to continue the functions of the member APCDs and set and enforce air pollutant emission regulations for all stationary sources within its jurisdiction and unify and organize the control program; however, the district has no control over mobile sources.

California State Air Resources Board

The State Air Resources Board (ARB) was established in 1967 and is responsible for coordinating all air pollution control activities in the state. Under state law, local APCD's have the primary responsibility for control of pollutants emitted from stationary sources while the ARB and the Federal Environmental Protection Agency share responsibility for control of emissions from mobile sources. In addition, the ARB has set ambient air quality standards, defines air basins within the state, and conducts research.

Environmental Protection Agency

Under the authority of the Clean Air Act of 1970, the EPA has established National Ambient Air Quality Standards, but has left the initial responsibility of meeting the standards up to the individual states. Each state was required to divide its area into Air Quality Control Regions according to meterologic and topographic characteristics, and develop appropriate control plans to achieve and maintain NAAQS.

Air Quality Control Strategies

In 1972, the state adopted a federally required implementation plan which was submitted to the EPA. The strategy included in the plan deals with reduction of emissions from both vehicular and stationary sources. Strategy for curtailing emissions from motor vehicles were primarily developed by the ARB while plans to reduce air pollution from stationary sources were formulated jointly between air pollution officials from each of the air basins of the state, and the ARB. The plan, however, was only partially approved by EPA, because of its failure to achieve federal air quality standards in certain areas of the state (including the South Coast Air Basin) by the prescribed time (1975). EPA has since promulgated several control measures and extended the attainment date to 1977. This was done to fulfill the legal requirement that if a state does not develop a control strategy meeting the deadline, EPA is required to develop and implement control strategies so that standards are met.

The proposed strategies include Transportation Control Plans (TCP), Parking Management Plans, indirect source review and controls, Air Quality Maintenance Plans, and Emergency Episode Plans. The Transportation Control Plan and Air Quality Maintenance Plan are the most important as the first is to be the primary means to achieve NAAQS and the latter is to maintain them. A Ninth Circuit Court Decision (September, 1975), however, has held that EPA does not have enforcement power to require the states to implement the portions of the TCP that are not directly under the State's control. Such measures such as increased bus service would need to be enforced with the specific responsible implementing entity.

The various strategies are briefly described below:

1. Transportation Control Plan is designed to deal with the basin-wide photochemical oxidant problem which is assumed to be the most significant air pollution problem. The TCP is directed towards reducing the amount of vehicle miles traveled (VMT) and the dependency on the private automobile. This is to be accomplished by development of exclusive bus/car pool lanes, improved local transit, park and ride facilities, development of mass rapid transit, disincentive for use of the private automobile, retrofit emission control devices and mandatory vehicle inspections. Some of these strategies had been previously begun (El Monte Busway along the center median of the San Bernardino Freeway and retrofit emission control devices[1]) or are in planning stage or are being developed. (Initial development of Mass Rapid Transit presently being considered by Southern California Rapid Transit District and Santa Monica Freeway exclusive bus lane.)

2. Air Quality Maintenance Plans - Air Quality Maintenance Areas are those in which National Ambient Air Quality Standards are presently being exceeded or are expected to be exceeded in the future (before 1985). The EPA has required all states to designate such areas and submit Air Quality Maintenance Plans (AQMP) as part of the State Implementation Plan. Due to the extreme complexity and severity of the air quality problem, it is not expected that NAAQS will be attained in the South Coast Air Basin by 1977, or even by 1985 with application of existing rules and regulations. Realizing that a long term strategy to achieve standards was needed, the Air Resources Board of California has designated Air Quality Maintenance Areas in California. The South Coast Air Basin has been designated as such an Air Quality Maintenance Area and the area being considered in this EIS is within the AQMA. Development for AQMP is presently under way.

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[1] Retrofit emission control legislation has been modified to require installation only when ownership of 1965-70 light-duty vehicles is transferred rather than on all 1965-70 light-duty vehicles.

At the present time a Policy Task Force for the South Coast Basin has been brought together to develop a plan to achieve and maintain the standards and is focusing its attention on developing an accurate emissions inventory and projection for the Air Basin. (See Table 2) The development of this inventory and the projection of future air quality is called the Phase I aspect of the Air Qual. Main. Plan. The Task Force also proposed various institutional mechanisms to accomplish the next phase, Phase II, of the AQMP effort, that is, the actual implementation of control measures to reduce emissions.

California Association of Governments as the 208 Areawide Agency, it is not clear at this time exactly what will be the institutional relationships for this Phase II effort.

3. Episode Avoidance Plans - The State Air Resources Board, in 1973, revised the State Implementation Plan to include Episode Avoidance Plans which were intended to deal with pollutant concentration levels at peak periods. Under the state's plan, authority is delegated to the local air pollution control districts to implement appropriate action to alleviate the situation when a pollutant concentration reaches a specific stage level. This plan had been adopted by the local county air pollution control district in 1974. With the formation of the Southern California Air Quality Maintenance District, the Episode Avoidance Plans were coordinated. In recent action (July 1977), the EPA has withdrawn its approval of the State's emergency, episode plan and will thus require redrafting.

Specific concentration levels and actions have been defined in the plan for photochemical oxidants, carbon monoxide and sulfur dioxide.

When a Stage 1, Health Advisory, level is predicted to occur or is reached, a warning is made public and persons with respiratory or cardiac disease are notified to take precaution against exposure and exertion. Schools are directly notified so that student participation in strenuous activities may be curtailed.

When a Stage 2, Warning, level is predicted to occur or is reached, a warning is issued and public appeal is made to reduce automobile traffic. Certain industries, government offices, schools, colleges, recreational facilities, and other establishments are required by SCAQMD to have Stage 2 and Stage 3 plans to reduce pollution emissions. These

Table 9

Number of Days Ozone Concentration (Kl Method), Daily One-Hour Maxima, Equalled or Exceeded Varicus Stage Levels, LA Basin (ppm) in the Los Angeles Basin, 1955-1974

Year	Stage 1 Health .20 ppm	Stage 2 Warning .35 ppm	Stage 3 Emergency .50 ppm
1955	170	74	22
1956	213	54	7
1957	169	29	4
1958	219	34	5
1959	182	34	2
1960	185	27	1
1961	140	13	0
1962	181	34	1
1963	131	8	1
1964	135	19	0
1965	148	30	3
1966	166	27	4
1967	157	38	4
1968	136	26	0
1969	139	33	3
1970	136	30	3
1971	100	10	1
1972	77	6	0
1973	79	8	1
1974	89	3	0
20 Year Average	148	27	3

Source: Southern California Air Quality Maintenance District

Table 10

Number of Days, Carbon Monoxide Concentrations Equalled or Exceeded Various Stage Levels LA Basin (ppm)

Year	Stage 1 Health Advisory		Stage 2 Warning		Stage 3 Emergency	
	4 ppm 1 hr.	20 ppm 12 hr.	75 ppm 1 hr.	35 ppm 12 hr.	100 ppm 1 hr.	50 ppm 12 hr.
1970	11	n.a.	0	0	0	0
1971	4	n.a.	0	0	0	0
1972	4	n.a.	0	0	0	0
1973	4	n.a.	0	0	0	0
1974	2	18	0	0	0	0
1975	3	18	0	0	0	0

Table 11

Number of Days Sulfur Dioxide Concentrations Equalled or Exceeded Various Stage Levels LA Basin (ppm)

Year	Stage 1 Health Advisory		Stage 2 Warning		Stage 3 Emergency	
	.5 ppm 1 hr.avg.	.2 ppm 24 hr.avg.	1 ppm 1 hr.avg.	.7 ppm 24 hr.avg.	2 ppm 1 hr.avg.	.9 ppm 24 hr.avg.
1970	1	0	0	0	0	0
1971	2	0	0	0	0	0
1972	1	0	1	0	0	0
1973	0	0	0	0	0	0
1974	0	0	0	0	0	0
1975	0	0	0	0	0	0

plans include pollution lowering methods such as car pooling, increased bus transportation useage, or reducing industrial operations. These industries and establishments due to their varying types of operations would have varying curtailment plans. As a Stage 2 level is predicted or is reached, the SCAPCD requests through the mass media that these curtailment plans be implemented.

When a Stage 3, Emergency Episode, is predicted or is reached, the state will be called on to take action under the appropriate provisions of the State Peace-Time Emergency Plan. These actions could involve the mandatory closing of all industrial plants, retail and service establishments, and maximum reduction in effect for electrical power production.

In the South Coast Air Basin both oxidant (ozone) and carbon monoxide levels have exceeded episode stage levels. Tables 9 - 11, indicate the numbers of days annually in which various episode stage levels have occurred in the Los Angeles basin.

Vehicles Miles Traveled in the Study Area

Since it is generally accepted that poor air quality in the study area is primarily the result of pollutant emissions from motor vehicle travel, a description of travel patterns in the LVMWD/TCSD area has been included here.

Data that has been utilized here has been obtained by the Los Angeles Regional Transportation Study (LARTS) of the California Department of Transportation. This study has been developed in cooperation with the Southern California Association of Governments (SCAG) and has utilized extensive data and assumptions developed by SCAG as to population, land use, employment, household income, etc. The actual transportation study model has analyzed the region according to analysis zones which largely correspond to census tracts. The methodology consisted of analyzing past and existing socio-economic characteristics of the analysis zones to determine the expected types (home-work, home-shopping, home-other, other-other, other work, etc.) and numbers of trips. These were analyzed with existing and proposed transportation networks and existing proposed land-use in an attempt to distribute the trips as well as analyze the possible modes of transportation that could be utilized. Within the study area, the existing highway and road network and existing bus service along Pacific Coast Highway were the primary means of travel. Anticipated transit services have been considered in the overall study, however, these lines and systems would not provide direct service to the study area and would require an auto trip to a point of connection (park and ride). These types of trips were included in the project vehicle miles traveled for the study area. According to LARTS, current studies with SCRTD involve different alternatives with related assumptions, all generating differing VMT.[1]

The average daily vehicle miles traveled (VMT) in 1970 for the LVMWD/TCSD study area was estimated to be 1,368,000 at a population of 22,253 by the Los Angeles Regional Transportation Study (LARTS). A significant portion of this VMT is generated by the crossing of the Ventura Freeway through the study area which permits a large amount of transient traffic to cross to and from other portions of the metropolitan area. Of this estimated VMT, 88% has been attributed to freeway traffic.

In 1974 the average daily VMT was estimated to be 1,675,500 with an estimated population of 37,652 and the percentage attributable to freeway traffic was 84%. Projections by LARTS for 1990 indicate that the 1990 VMT, 73% is expected to be attributable to freeway traffic. When these figures are analyzed on a per capita basis, it can generally be seen that individual vehicle miles traveled are declining. In 1970 the daily VMT per capita was estimated to be 61.47; in 1974 the VMT per capita was estimated to be 29.75. This reduction results primarily from the increased development of commercial and industrial uses in the Triunfo area which in turn has begun to lessen the need for traveling great distances for employment, goods or services.

There remains, however, a large number of automobile trips from individuals driving to and from work outside the study area. It has been estimated that in 1970 there were 2,700 jobs in the Las Virgenes area.[2] When this is compared with the 1970 census data of the work force in Las Virgenes (7,060), it becomes apparent that a large number of the work force must travel outside the primary study area for employment.

Additionally, residents in the study area are often forced to travel outside the study area for shopping and cultural activities as there are no major regional shopping centers in the area and few cultural facilities with the exception of facilities at Pepperdine University in Malibu.

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1. Mr. Hillel J. Amos, CALTRANS, telephone communication

2. Los Angeles County, Department of Regional Planning, Los Angeles County General Plan, 1973

Table 12

DAILY VMT ANALYSIS, 1970, 1974 & 1990

	1970		1974		1990		VMT Per Capita		
	Est. VMT	Est. Pop.	Est. VMT	Est. Pop.	Est. VMT	Est. Pop.	1970	1974	1990
Las Virgenes									
Total	1,165,485	18,935	1,419,258	26,960	1,624,935	43,000	61.55	52.64	37.79
(w/o freeway)	(132,268)		(209,714)		(309,966)		(6.98)	(7.78)	(7.21)
Triunfo									
Total	202,515	3,318	256,242	10,692	584,204	31,264	61.04	23.97	18.69
(w/o freeway)	(30,502)		(59,442)		(295,276)		(9.19)	(5.56)	(9.44)
Total	1,368,000	22,252	1,675,500	37,652	2,209,139	74,264	61.47	44.50	29.75
(w/o freeway)	(162,770)		(269,156)		(605,242)		(7.31)	(7.15)	(8.15)

Source: LARTS - Analysis Zones 4301,4302,4303 (Las Virgenes)
4209,4208.212 (Triunfo)
9101,1092 (Malibu)
9201 (Topanga)

TABLE 13

STUDY AREA WORKERS' MEANS OF TRANSPORTATION AND PLACE OF WORK

Means of Transportation	**Las Virgenes Municipal Water District region****	**Triunfo County Sanitation District region***
All Workers:	7060 (100%)	1146 (100%)
Private Auto		
Driver	6102 (86.5%)	993 (86.6%)
Passenger	473 (6.7%)	22 (8.0%)
Bus	8 (0.1%)	9 (0.8%)
Walked	108 (1.5%)	5 (0.5%)
Worked at home	249 (3.5%)	22 (1.9%)
Other	120 (1.7%)	24 (2.1%)
Place of Work		
All Workers: (LA County Residents)	7060 (100%)	
LA Central Business District	180 (2.5%)	
Remainder of LA City	3363 (47.6%)	
Remainder of LA County	2481 (35.1%)	
Outside LA County	549 (7.8%)	
Workplace not reported	487 (6.9%)	
All Workers: (Ventura County Residents)		1146 (100%)
Ventura County		241 (21.0%)
Outside Ventura County		887 (77.3%)
Workplace not reported		18 (1.6%)

Source: 1970 Census Data

LVMWD Region: LA-Long Beach SMSA, Census Tracts 8001-8003.02
TCSD Region: Oxnard-Ventura SMSA, Census Tracts 59.03, 74

2.2.4 Topography

Much of the study area is comprised of rugged mountainous terrain. The more rugged areas are within the Santa Monica Mountains portions while the interior highlands and the Simi Hills are more rolling and subdued in their topographic features. The mountainous coastal areas, characterized by steep hillsides that descend abruptly into narrow canyons, contain approximately 22 distinct canyons that extend inland. The most prominent of these are Malibu Canyon and Topanga Canyon. The interior area is characterized by alluvial valleys and rolling hills which are currently in agricultural use or being developed for urban uses.

The topographic relief ranges from sea level at the coast to elevations of between 1800' and 2800' in the interior. The highest elevation within the study area is Castro Peak at 2824 feet, while the interior valleys vary in their general elevations. Hidden Valley at the western portion of the study area is approximately 1000 feet above sea level. Russell and Lindero Canyon are approximately 900 feet elevation. Las Virgenes Valley is approximately 700 feet in elevation and slopes downward to approximately 600 feet elevation in the vicinity of the confluence of Las Virgenes and Malibu Creeks.

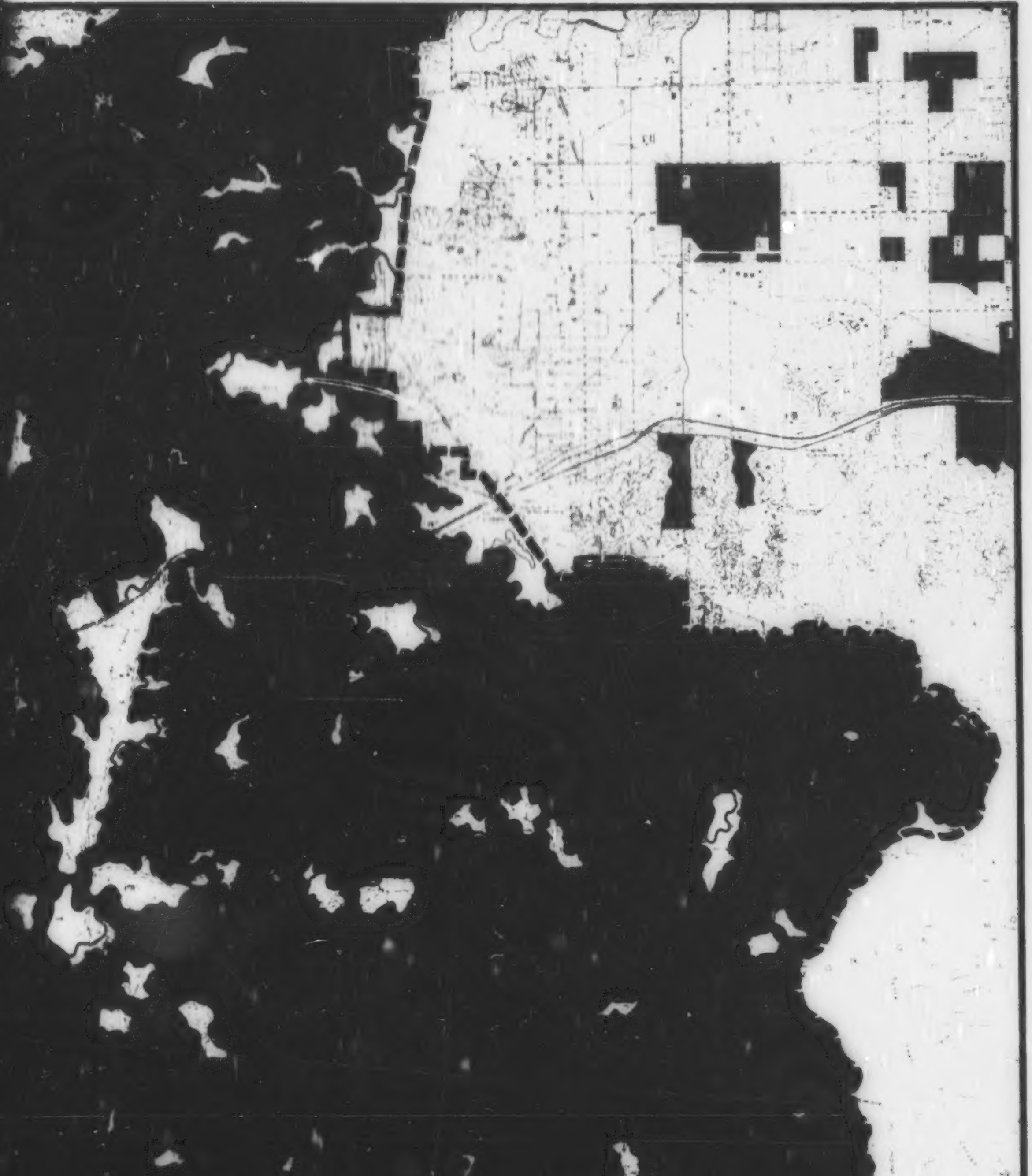
Of the study area's total of 145,926 acres, the majority can be classed as having an average gradient of 35% and above. This gradient class is generally accepted as being not economically feasible for mass urban development nor environmentally desirable. The topographic analysis of the site is as follows:

Slope Class	No. of Acres	% of Total Area
35% + above	65,401	45%
20-35%	42,740	29%
10-20%	21,300	15%
0-10%	16,485	11%
TOTAL	145,926 acres	100%

The Slope Map, Figure 25, depicts the location of these classes. The Elevation Map, Figure 26, indicates the height of various locations in the study area.

Due to the size of the study area, original mapping has been developed at a scale of 1" = 2000' and is thus not able to define small individual parcels which may have more complex topography than shown on these maps. The purpose of the maps is not to precisely identify specific areas that would present constraints for urban development or individual sewage systems but rather to present a means to comprehend

EIS/EIR
Las Virgenes-Triunfo
Malibu-Topanga
Area Wide Facilities Plan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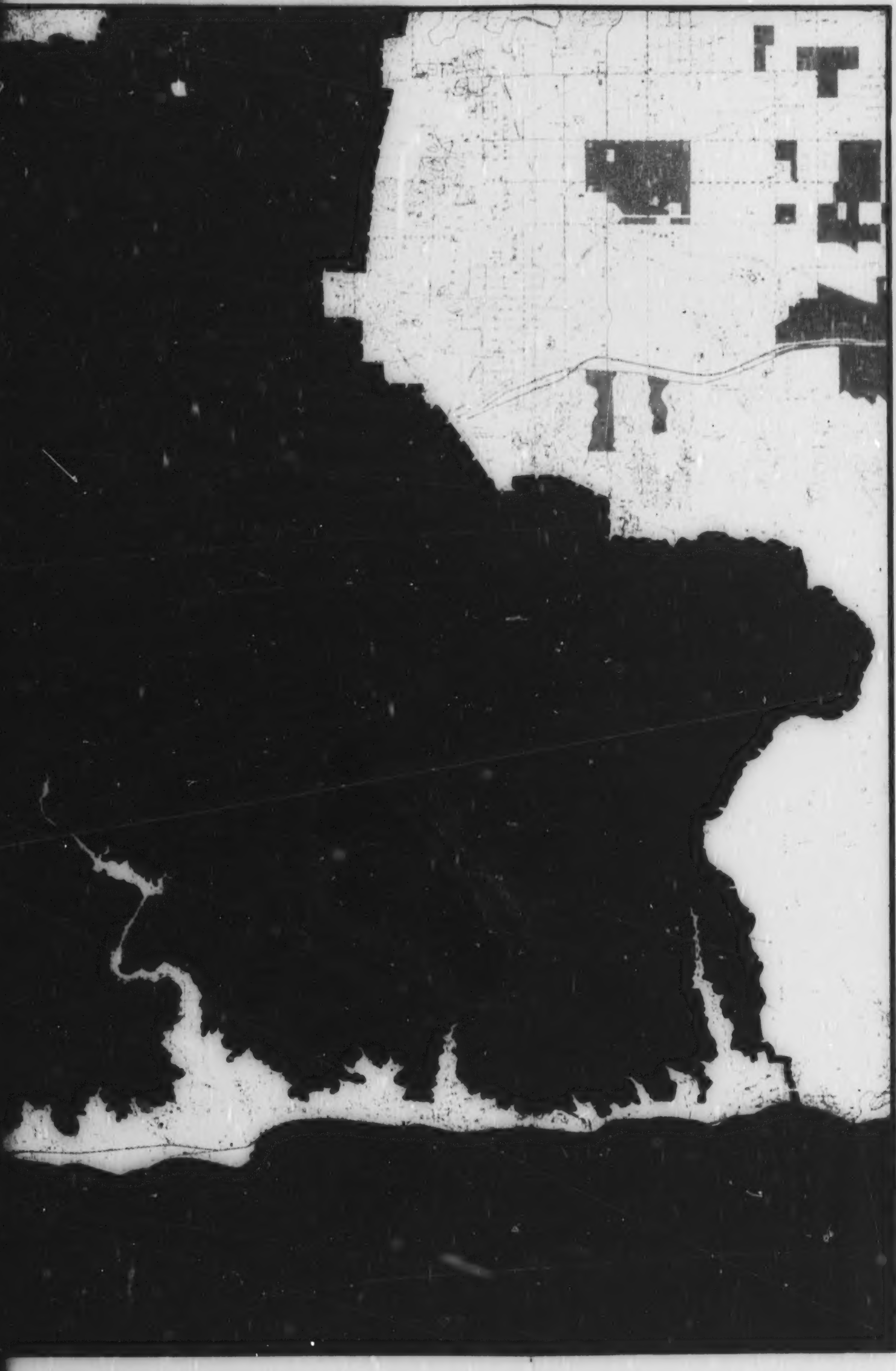
North
Scale

slope

fig. 25

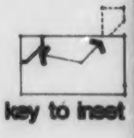
2-39-A



EIS/EIR

Las Virgenes-Triunfo
Malibu-Topanga
Area Wide Facilities Plan

500 foot contours
500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elevation analysis

fig. 2

2-39-B

the overall topographic characteristics of the study area and the relationship of one area with another. General location planning and environmental considerations are then able to be developed.(This mapping is also consistent with state and federal sources.)

2.2.5 Hydrology

Introduction

The Malibu Hydrographic Unit is situated in the northwestern portion of the Los Angeles River Basin and occupies about 242 square miles of the western portion of Los Angeles County and the southeastern portion of Ventura County. As defined by the Regional Water Quality Control Board, it comprises the area which drains Topanga Canyon, the Malibu Creek drainage area, and the area located between the Pacific Ocean and the ridge lines of Brents Mountain and Boney Mountain. Within this area are the Topanga, Malibu Creek, Point Dume and Camarillo Hydrographic Subunits.

Steep and rugged mountains containing many small valleys and canyons, including Las Virgenes Canyon, Malibu Canyon, Hidden Valley, Russell Valley, and Triunfo Canyon, characterize the Malibu area. Many small streams along the coastline drain directly into the ocean, particularly in the Point Dume and Camarillo Hydrographic Subunits.

During the summer months the stream flow collects behind small lagoons located at the mouths of each creek. During winter months the lagoons are partially drained by clearing a temporary channel. Channelization is done to keep the lagoon from filling and raising the water table and adversely affecting nearby waste disposal systems. At times winter flows are sufficient to completely destroy the enclosing sand bar for short periods of time allowing complete flushing of each lagoon. During these times, large amounts of sediment are transported seaward and are eventually deposited offshore or distributed along the adjacent beaches. The streams in the area are essentially unregulated, although there are several dams constructed on some of the streams or tributaries. These are used primarily for recreation and are kept full or nearly full almost all of the time and therefore do not serve as reservoirs for restricting flood flows or maintaining minimum stream flows.

Distinctive Units and Characteristics

The major surface water features within the study area are Malibu Creek, Malibu Lagoon, Malibu Lake, Westlake, Westlake Reservoir and Lake Sherwood. These and other important surface water developments are shown on Figure 27. The Regional Quality Control Plan established the following table stating present development and project purpose. (See Table 14.)

The Surface Hydrology Map (see Figure 27) delineates the drainage basin, locations of streams, stream gauging stations, and reservoirs. The streams shown by dashed lines are intermittent (not flowing all year). Streams shown by solid lines are perennial (flowing all year). It must be noted here that there are virtually no "perennial" streams in the study area; however, in a study prepared by Earl S. Flowers of the School of Public Health at the University of California at Los Angeles it was observed that in the period of June, 1971 to September, 1971, these streams exhibited surface flows. Additional data has been provided by David M. Brown (resident of the area and local authority of natural resources of the area). No attempt has been made to identify all sources of causes of flow in these streams.

Water Quality Objectives

The Water Quality Control Plan Report for the Los Angeles Region has established objectives for surface water within the study area. Due to the limited surface water quantity and ability to be used for recharge of the ground water basins, the objectives are to use fresh surface waters for contact and non-contact recreation, as well as wildlife habitat. Beneficial uses for ground water have been designated for municipal and domestic supply and to maintain the current limited use and agricultural supply. In conjunction with these objectives for beneficial use, water quality objectives for ground water were established. These are listed in Tables 15 and 16 along with existing ground water quality data.

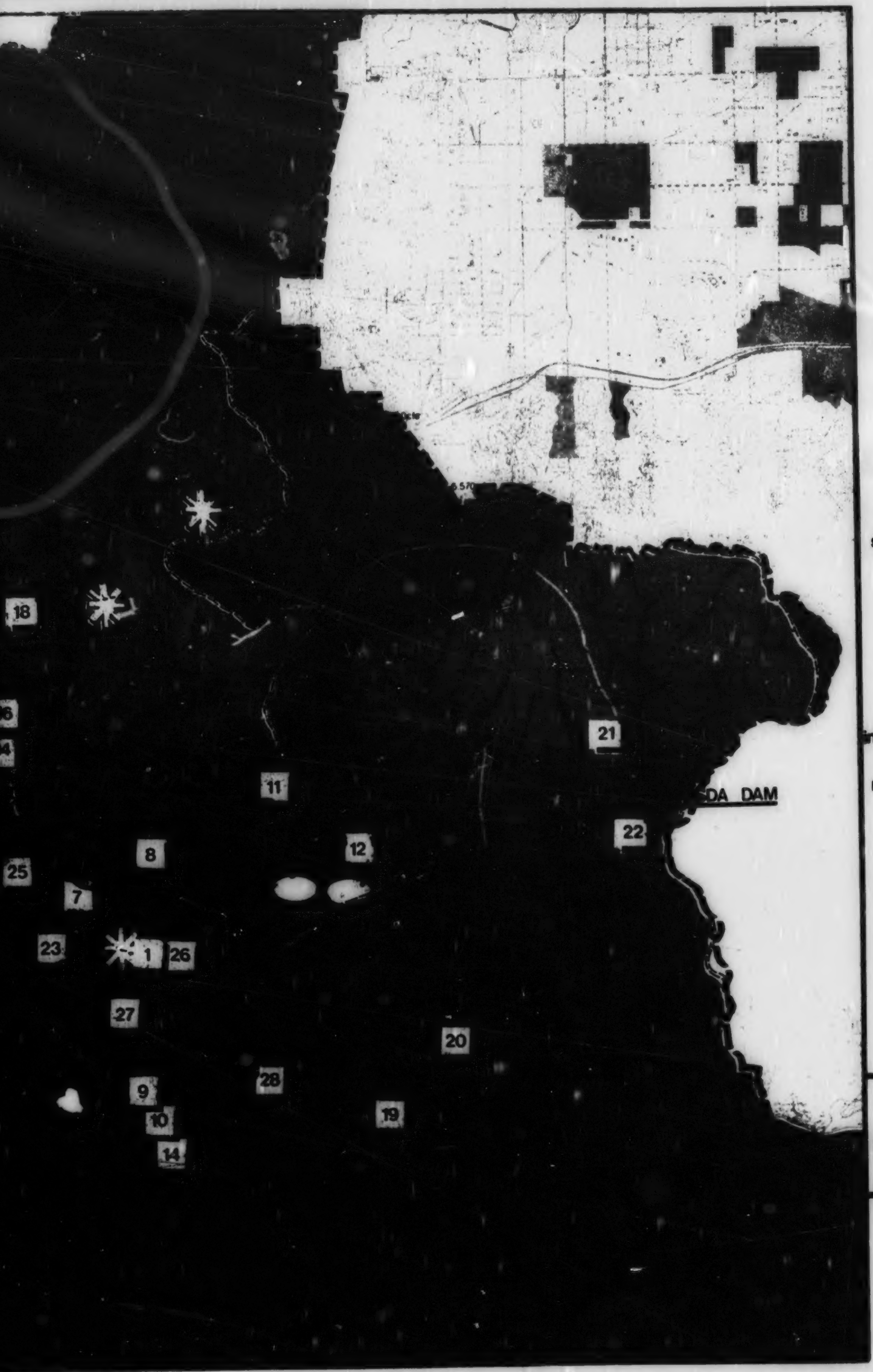
These water quality objectives are broad in scope and not all inclusive. Areas not addressed are specifically the quality of water used for private domestic use in isolated portions of the basin and that which will be used for irrigation of certain crops and for certain farmstead uses.

The State Water Resources Control Board, in the Water Quality Control Plan Report for the Los Angeles Region, has noted that streams within the study area basin have met both the 1974 and 1977 federal and state water quality objectives. (See Table 17.)

The water quality control plan for the Los Angeles Basin has also stated that within the Malibu Hydrographic unit poor soil conditions and lack of adequate land for disposal have created a potential health hazard. Septic tanks continually require pumping out, and the threat of overflow to surface or coastal waters exists, although no evidence of a health hazard has ever been recorded.

15
4
5
3
1
6

EIS/EIR
Las Virgenes-Triunfo
Malibu-Topanga
Area Wide Facilities Plan


18
6
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DA DAM
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14
19
570
year-round stream flow which may be man-caused
year-round stream
seepage area
springs
year-round pool
streams not year-round in 1963-67 or are not so now
source: David Brown
springs
seepage areas
intermittent stream
perennial stream
monitoring station
23
key to inset
0
1000'
3000'
2000'
0
3000'
North
Scale

surface hydrology

fig. 27

TABLE 14

PRESENT AND POTENTIAL LOCAL SURFACE WATER DEVELOPMENT IN THE MALIBU HYDROGRAPHIC UNIT

				Reservoir Capacities		
Reservoir and/or Dam	Year Completed	Owner and/or Operating Agency	Stream and Source of Water if Different	Maximum Storage Capacity (Acre-Ft)	Annual Yield (Acre-Ft)	Project Purpose
Present						
Century Dam Malibu Creek Subarea,	1913	State Dept. of Parks and Recreation	Malibu Creek	70	–	S
J. W. Wieda Dam Topanga Canyon Subarea,	1958	State Dept. of Parks and Recreation	Trib. Topanga Canyon	45	–	S, D
Lindero Dam Lindero Canyon Subarea	1966	Boise Cascade Building Co.	Lindero Creek	90	–	S, D
Malibu Lake (Malibu Lake Club Dam) Triunfo Canyon Subarea	1923	Malibu Lake Mountain Club Ltd.	Malibu Creek	500	–	S
Potrero Dam Russell Valley Subarea	1967	Westlake Village A Partnership	Potrero Valley Creek	791	–	S, D
Westlake Reservoir Russell Valley Subarea	1972	Las Virgenes Municipal Water District	Three Springs Creek and California State Water Project	10,000	-	
Lake Eleanor Dam	1881	Westlake Village A Partnership	Eleanor Creek	104	–	S
Lake Sherwood Dam	1904	Dayton Realty Company	Triunfo Creek	2,694	–	S

NOTES: Project Purpose

S = Storage
D = Diversion

Source: Water Quality Control Board

TABLE 15

WATER QUALITY OBJECTIVES FOR GROUNDWATER BASINS

Area	Objective (mg/l)			
	TDS	Sulfate	Chloride	Boron
Malibu Hydro Unit				
Topanga Subunit	2,000	500	50[illegible]	2
Malibu Creek Subarea	2,000	500	500	2
Las Virgenes Subarea	2,000	500	500	2
Lindero Canyon Subarea	2,000	500	500	2
Triunfo Canyon Subarea	2,000	500	500	2
Russell Valley Subarea	1,500	500	250	1
Sherwood Subarea	1,000	250	250	1
Point Dume Subunit	1,000	250	250	1
Camarillo Subunit	1,000	250	250	1

Existing Water Quality for Ground Water Basins:

Area	TDS	Sulfate	Chloride	Boron
Malibu Hydro Unit				
Topanga Subarea	1,291	498	103	.91
Malibu Creek Subarea	2,184	458	551	.70
Las Virgenes Subarea	1,947	879	101	.35
Lindero Canyon Subarea	2,373	1,000	238	2.02
Triunfo Canyon Subarea	2,080	970	95	.37
Russell Valley Subarea	1,015	313	61	.19
Sherwood Subarea	530	101	46	.09
Point Dume Subunit	1,059	251	186	.24
Camarillo Subunit	791	240	72	.48

Source: Regional Water Quality Control Board (4)

TABLE 16

TOXICANT AND RADIOACTIVITY WATER QUALITY OBJECTIVES FOR ALL GROUNDWATER BASINS

Parameter	Objective (mg/l)
Arsenic	0.10
Barium	1.0
Cadmium	0.01
Chromium (Total)	0.05
Cyanide	0.2
Lead	0.05
Mercury	0.005
Nitrate-N plus Nitrite N	10.0
Selenium	0.01
Fluoride	1.0
Carbon-alcohol extract (CAE-m)	3.0
Carbon-chloroform (CCE-m)	0.7
Foaming Agent (MBAS)	0.5
Pesticides	
Aldrin	0.017
Chlordane	0.003
DDT	0.042
Dieldrin	0.017
Endrin	0.001
Heptachlor	0.018
Heptachlor Epoxide	0.018
Lindane	0.056
Methoxychlor	1.0
Organophosphorus and Carbonate Compounds	0.1 (as parthion in cholinesterase inhibition)
Toxaphane	0.005
Herbicides	
2, 4-D plus; 2, 4, 5-T plus; 2, 4, 5-TP	0.1
Radioactivity (pCi/1)	
Gross Beta	1,000.0
Radium-226	3.0
Strontium-90	10.0

Source: Water Quality Control Board

TABLE 17

CLASSIFICATION OF WATER SEGMENTS WITHIN BASIN

Category and Name of Water Segment	WQ Objectives Met 1974	WQ Objectives Met 7/1/77	Segment Classif.	Remarks
Malibu Creek	Yes	Yes	Effluent Limitation	Minor runoff from spray disposal area for Tapia WRF.
Big Sycamore Cyn. Cr.	Yes	Yes	"	No point source pollutant discharge involved.
Little Sycamore Cyn. Cr.	Yes	Yes	"	No point source pollutant discharge involved.
Arroyo Sequit	Yes	Yes	"	No point source pollutant discharge involved.
Nicholas Cyn. Cr.	Yes	Yes	"	No point source pollutant discharge involved.
Los Alisos Cyn. Cr.	Yes	Yes	"	No point source pollutant discharge involved.
Lachusa Cyn. Cr.	Yes	Yes	"	No point source pollutant discharge involved.
Encinal Cyn. Cr.	Yes	Yes	"	No point source pollutant discharge involved.
Trancas Cyn. Cr.	Yes	Yes	"	No point source pollutant discharge involved.
Zuma Cyn. Cr.	Yes	Yes	"	No point source pollutant discharge involved.
Ramera Cyn. Cr.	Yes	Yes	"	No point source pollutant discharge involved.
Escondido Cyn. Cr.	Yes	Yes	"	No point source pollutant discharge involved.
Latigo Cyn. Cr.	Yes	Yes	"	No point source pollutant discharge involved.
Solstice Cyn. Cr.	Yes	Yes	"	No point source pollutant discharge involved.

Source: Regional Water Quality Control Board

TABLE 17 (Continued)

CLASSIFICATION OF WATER SEGMENTS WITHIN BASIN

Category and Name of Water Segment	WQ Objectives Met 1974	WQ Objectives Met 7/1/77	Segment Classif.	Remarks
Topanga Cyn. Cr.	Yes	Yes	Effluent Limitation	No point source pollutant discharge involved.
Corral Cyn. Cr.	Yes	Yes	"	Proposed Corral Canyon WRP will discharge surplus tertiary effluent to Creek.
Puerco Cyn. Cr.	Yes	Yes	"	No point source pollutant discharge involved.
Marie Cyn. Cr.	Yes	Yes	"	No point source pollutant discharge involved.
Carbon Cyn. Cr.	Yes	Yes	"	No point source pollutant discharge involved.
Las Flores Cyn. Cr.	Yes	Yes	"	No point source pollutant discharge involved.
Pena Cyn. Cr.	Yes	Yes	"	No point source pollutant discharge involved.
Tuna Cyn. Cr.	Yes	Yes	"	No point source pollutant discharge involved.
Malibu Creek Lagoon	Yes	Yes	"	No significant point source pollutant presently involved. Future proposed flow augmentation would involve Tapia WRF effluent.

Source: Regional Water Quality Control Board

Surface Water Characteristics

With the varied rainfall pattern and diverse topography, there is a general deficiency of local surface water supply.

Malibu Creek, its tributaries, and a number of relatively small canyons drain the entire hydrographic unit directly to the ocean. Among the more significant canyons are Big and Little Sycamore Canyons in Ventura County, Arroyo Sequit, Trancas, Zuma, Escondido, Solstice, Corral, Las Flores, and Topanga Canyons in Los Angeles County.

Flow in virtually all streams is intermittent and the amount of water is very limited. There are few places where significant amounts of surface water can be found other than during the wet winter and spring seasons. The mean monthly discharge for Malibu Creek and Topanga Creek approximates 1 cfs during the summer months.

LACFD records from 1931-1968 indicate maintenance of at least minimal flows (.4 cfs) in Malibu Creek during this 37-year period. Detail flow information for the entire study area is incomplete. The gauging stations maintained by the Los Angeles County Flood Control District monitor only the upper reaches of Malibu Creek and the mouth of Topanga Creek.

Because of the steep terrain and shallow soil mantle, flood flows peak rapidly and then quickly subside -- very often within a period of a few hours. For example, on January 24 and 25, 1969, the following data were recorded at Malibu Creek and at Crater Camp Station 1 (see Figure 27):

Day	Time	Discharge (cfs)
January 24	1600	899
	1800	1,360
	2200	2,010
	2400	3,480
January 25	0200	8,270
	0400	12,000
	0600	28,200
	0900	33,700
	1800	8,400

Mean monthly flow (cfs) for the years 1933-1975 past the Malibu Creek and the Topanga Creek Stations Nos. 1 and 2 (Malibu Creek at Crater Camp and Topanga Creek near Topanga Beach) is shown in Tables 18 and 19 (Topanga Creek for 1930-1968).

Figures for Malibu Creek, 1933-1975 (see Table 18), include the flow of the Tapia Water Reclamation Facility after 1965 which was operating at that time to its .5 mgd capacity. The Tapia Plant was expanded to 2.5 mgd capacity in water year 1967-1968.

In comparison to mean and median flows of the 1933-1964 period, the flows in Malibu Creek since 1965 have increased progressively. This condition could be attributed to Tapia WRF discharges and disposal methods, as well as increased urban runoff flows and agricultural runoff flows.

Since increased urbanization and other factors in the study area during this period have created additional quantities of runoff, the extent of effect upon total creek flows specifically attributable to Tapia WRF flows is not precisely quantifiable. Additionally, vagaries of rainfall during this period further compound the problem of developing precise conclusions about individual incremental contributions to total Malibu Creek flows.

In Topanga Creek the maximum recorded flow was 12,200 cfs in January, 1969. In Malibu Creek the maximum recorded flow in January, 1969 was 33,700 cfs. These flows include discharge of up to 6 cfs from the Tapia Water Reclamation Plant into Malibu Creek based on their operating permit, during the winter months.

The 1970 Los Angeles County General Plan shows no flood hazard areas within the study area; however, above-average rainfall has the capacity to turn dry arroyos into raging streams within minutes of precipitation due to topography and soil conditions.

The Los Angeles County Engineer has prepared a Master Plan of Storm Drains for the Malibu area based on runoff figures developed by the Los Angeles County Flood Control District (LACFCD). This plan was prepared in 1969 based on existing and projected land use at that time. The information developed is valuable for the drainage basins calculated; unfortunately, the master plan does not include all of the watersheds within the study area. (See Figure 27.)

The quantity of runoff was calculated using the Rational Method for 25-year frequency storms. The method is stated by the formula $Q = CiA$. Q is the quantity of flow in cubic feet per second; i is the average rainfall intensity in inches per hour; C is a coefficient measuring the percentage of rainfall that becomes surface runoff; and A is the tributary area in acres.

TABLE 18

DAILY FLOW, BY MONTH, MALIBU CREEK
(STATION #1, CRATER CAMP)
(WATER YEARS, 1933-1975)
(IN CUBIC FEET/SECOND)

Period of Record	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT
Mean 1933-64	.365	1.469	7.123	50.892	62.104	73.100	21.199	4.196	1.785	.743	.396	.617
Median 1933-64	.17	.31	.64	2.96	12.8	6.61	3.77	2.52	1.07	.37	.28	.22
1965	.07	.10	.16	.16	.25	.55	21.1	1.98	.84	.35	.26	.14
1966	.17	195	292	65.8	37.6	13.9	6.75	3.87	2.33	1.31	1.06	.96
1967	1.13	15.9	112	176	27.8	21.3	47	12.1	4.09	2.6	1.91	1.56
1968	1.43	75.9	25	16.1	6.84	74.5	9.02	4.35	2.9	1.72	1.36	1.45
1969	1.89	1.97	2.79	1350	448	104	34.2	15.4	9.76	5.97	3.96	5.29
1970	4.72	5.60	4.53	6.38	20.1	56.4	5.93	4.13	3.37	2.31	2.11	3.94
1971	3.12	58.7	142.4	21.2	16.5	10.9	12.4	5.87	4.43	3.26	3.13	3.40
1972	3.91	1.84	34.4	7.24	5.99	4.6	2.4	2.14	2.92	2.07	2.03	1.57
1973	2.31	7.83	4.08	36.2	261	84.5	20.5	9.9	5.55	3.42	1.91	2.58
1974	3.46	5.51	8.95	163	15.2	31.2	10.2	7.28	5.4	3.67	3.67	3.94
1975	4.8	5.3	31.6	8.4	25.2	63.1	20.2	7.8	5.5	3.5	4.1	3.5

* Downstream from Tapia WRF

Source: Los Angeles County Flood Control District Gauging Station Records

TABLE 19

MEAN MONTHLY FLOWS FOR TOPANGA CREEK

(STATION #2, NEAR TOPANGA BEACH)
(BY WATER YEARS, 1930 TO 1968)
(IN CUBIC FEET/SECOND)

Period of Record	O	N	D	J	F	M	A	M	J	J	A	S	Annual
Topanga Creek near Topanga Beach 1930-31 to 1967-68	0.1	2.6	4.6	11.9	17.4	11.3	5.6	0.8	0.3	0.1	0.1	0.1	4.5

Precipitation varies across the study area from 12 inches in the lower elevations near the coast and inland valleys to almost 25 inches at the higher elevations. Precipitation variation across the relatively short distance combined with the topography, varied geology and vegetation, make accurate runoff computations difficult. In addition, historical information is incomplete and does not permit comparisons to be made with present conditions.

Rainfall intensities are based upon times of concentration (tc), the time that is required for water from the most remote portion of the watershed to reach a collection point. Intensities were obtained from curves compiled by the LACFCD relating tc in minutes and i in inches per hour. The runoff coefficient C varies with the soil, land usage, and rainfall intensity. The LACFCD has conducted tests throughout this area to measure the ratio of runoff to rainfall. Runoff was calculated by LACFCD to meet projected land usage as shown in the 1965 General Plan - Malibu Area. Clear flows and bulked "Q" flows (a factor for debris in water) varied throughout the water shed from 88 percent and above as clear flow runoff for Medea Creek, Arroyo Deduit, Trancas-Zuma; Las Virgenes Creek, West Malibu, and Point Dume coastal drainage basins to flows that were virtually 50/50 clear/bulked, such as East Malibu coastal and Malibu Creek drainage basin. Several basins had no design information available such as Encinal Beach and Arroyo Calabasas drainage basin.

Calabasas Creek flowing from the northeast corner of the study area and providing drainage of the Hidden Hills, Calabasas area has had no monitoring of water flow. It has been observed that this stream is of an intermittent nature and during normal dry seasons exhibits no surface flow.

Records of Ventura County Flood Control show that Conejo Creek, which flows northwest from the study area, has a dry weather flow of approximately 6.74 cfs at a point just downstream of Hill Canyon. This flow is believed to be almost entirely generated by the Hill Canyon Water Treatment Plant, which is also located outside the study area.

Chief factors contributing to the extremes in flows from the streams in the area are the steepness and rugged characteristics of the Santa Monica Mountains, the overall impermeable characteristics of the underlying rocks and the thin soils that mantle the rocks in most places. Brush fires have also contributed to rapid runoff in the mountainous areas by destroying vegetative cover. Locally, the alluvium in the valley floors, particularly along the tributaries of Malibu Creek, serves as temporary storage for runoff. Under conditions of prolonged rainfall, the water storage capacity is soon exceeded and as a consequence, nearby streams respond rapidly to changes in the intensity of precipitation. Water stored in the alluvium and bedrock is released slowly throughout the year and serves to support the low flow discharge of both creeks.

In the Flowers' study, it was observed during June, 1971 to September, 1971, that waters flowing into the Malibu Creek water shed had two principal sources: (1) springs issuing from bedrock aquifiers, and (2) seepage areas where water was rising to the surface through porous stream alluvia. (See Figure 27.) The sources of this ground water are unknown. No correlation of this data with effluent disposal by spray irrigation can be made as the seepage is consistent throughout the stream valleys of the study area and not isolated to those areas receiving irrigation.

Surface Water Quality

Surface water quality within the Malibu water shed has been described by Earl S. Flowers, Ph.D. School of Public Health, U.C.L.A., in a report published July, 1972. Water samples were analyzed for hardness, chloride, nitrate content, minor elements and suspended solids. Twenty-two points were sampled (Monitoring Stations 3 through 24). For monitoring station locations, see Figure 27. The data compiled from these analyses are shown in Tables 21-23.

The total dissolved solids, TDS, and hardness of the waters in the area exceed the maximum level (500 mg./l) established by the Federal Water Pollution Control Administration for surface water for public water supplies. The California Department of Health has established a recommended upper limit of 1000 mg/l; however, a temporary limit of 1500 mg/l is permitted where no other better water supply is available. The creek waters have TDS ranging from 440 mg/l to over 3,000 mg/l, and hardness of 206 mg/l to 1405 mg/l. Other constituents, such as chlorides, nitrates and iron, are within acceptable, but not desirable limits as determined by the Federal Water Pollution Control Administration for domestic use. The FWPCA sets limits of 500 mg/l for TDS; 300-500 mg/l for total hardness; 250 mg/l for chlorides; 10 mg/l for nitrates; and .3 mg/l for iron. No limits have been set for calcium, magnesium or silicon. The

TABLE 20

CHEMICAL ANALYSES OF MALIBU WATERSHED WATERS

CONCENTRATION IN PPM

Station	Date	Calcium	Magnesium	Iron	Silicon
3	8/10/71	55.445	28.300	0.002	8.25
4	"	137.458	65.801	0.009	3.80
5	"	375.490	113.601	0.018	18.50
6	"	151.26	20.000	0.025	14.70
7	"	198.908	55.006	0.010	15.24
8	"	156.988	38.410	0.015	20.00
9	"	180.385	48.500	0.017	12.80
10	"	171.569	109.500	NA	NA
11	"	126.219	42.000	0.010	14.75
12	7/27/71	NA	NA	0.005	11.75
13	8/10/71	250.000	805.000	NA	NA
14	8/10/71	200.000	806.000	NA	NA
15	7/27/71	46.243	22.000	0.007	NA
16	"	70.000	100.000	0.045	NA
17	"	120.000	95.000	0.015	14.75
18	"			0.080	7.23
19	"			0.014	6.90
20	"			0.005	8.50
21	"			0.033	9.76
22	"			0.028	8.60
23	"			0.015	12.70
24	9/30/71			NA	12.77

Source: Earl S. Flowers, Ph.D. School of Public Health, UCLA

TABLE 21

CHEMICAL ANALYSES OF MALIBU WATERSHED WATERS

CONCENTRATIONS IN mg/1

Station	Date	Hardness ($CaCO_3$)	Chloride	Nitrate	TDS
3	8/10/71	255	74	NA*	640
4	"	614	159	NA	1,952
5	"	1,405	195	NA	3,032
6	"	460	50	0.075	1,114
7	"	713	139	0.563	1,900
8	"	550	74	NA	1,028
9	"	640	149	0.558	1,464
10	"	879	1,607	NA	4,120
11	"	488	73	0.035	1,022
12	7/27/71	321	32	0.086	500
13	8/10/71	NA	18,494	NA	48,738
14	"	NA	20,345	NA	39,522
15	7/27/71	206	43	0.022	440
16	"	587.3	112	NA	3,238
17	"	299.64	109	NA	3,194
18	"	NA	130	NA	3,492
19	"	1,029	136	0.105	1,950
20	"	663	78	0.106	1,254
21	"	834	138	0.284	1,998
22	"	390	128	0.073	1,188
23	"	588	158	0.886	1,396

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*Not Analyzed

Source: Earl S. Flowers, Ph.D. School of Public Health, UCLA existing concentrations, however, would be acceptable for livestock uses as determined by FWPCA. The quality of the three major Los Angeles domestic water sources are shown for comparison:

(a) Owens Valley TDS 229 mg/l, hardness 96;

(b) Colorado River TDS 745, hardness 349; and

(c) State Project Water TDS 324, hardness 170.

The water quality varies in waters from the area. Along Liberty Canyon there is a similarity in TDS of well water (Station 17), pond water (Station 18), and surface creek water (Station 16). The TDS is higher here than in other localities in the area. The average water in the area has total dissolved solids in excess of 1,000 mg/l, and higher than 3,000 mg/l in Liberty Creek. It is interesting to note that Lake Sherwood (Station 15) and Westlake (Station 3) have lower dissolved solids than the other waters in the area; 440 mg/l and 640 mg/l respectively. The two lakes have the same source of water, being fed by Potrero Creek. Station 16 is from Liberty Creek; Station 17 is a well; and Station 18 is a pond. The three stations are located along Liberty Canyon and, hence, the close similarity in the dissolved solids concentrations (greater than 3,000 mg/l) is not surprising. On the other hand, Lake Lindero (Station 4) fed by the creeks flowing north from Las Virgenes hills, has 1952 mg/l of dissolved solids, compared to Westlake, about a mile to the west, with 640 mg/l. The high values of dissolved solids in Stations 13 and 14 (Malibu Lagoon) are due to the higher concentrations of magnesium and calcium in the marine environment.

Total Suspended Solids. Particulate matter, or compounds being carried by the water but not chemically changed by the water, as shown below, are comparatively lower than the concentrations of dissolved solids in the same sources.

Westlake	60 mg/l
Lake Lindero	60 mg/l
Malibu Lagoon	96 mg/l
Lake Sherwood	60 mg/l

Hardness. Water is classified with respect to hardness according to the following table, in terms of the amount of calcium carbonate or its equivalent.

Hardness (mg/l $CaCO_3$)	Classification (USGS-1970)
0-60	Soft
61-120	Moderately Hard
121-180	Hard
over-180	Very Hard

The hardness of the waters in the study area greatly exceed the values recommended for drinking by the U.S. Public Health Service. It ranges from 206 mg/l in Lake Sherwood to 1405 mg/l near the confluence of Lindero and Medea Creeks (Station 5). The hardness increases from 206 mg/l in Lake Sherwood, 255 mg/l in Westlake, and 614 mg/l in Lake Lindero. There is thus an increase in hardness from the upper to the lower course of Potrero Creek which feeds these three lakes.

Silica. There is no definite pattern in the distribution of silica ions in the waters from the area, except in the Cold Creek where there occurs a significant increase downstream. The average concentration in all the waters (11.823 ppm) is lower than that found in Los Angeles-Owens River aqueduct water supply which was as hign as 20.00 ppm (parts per million) in 1969-1970 fiscal year (Department of Water and Power, 1970). Well samples showed higher concentrations (13.51 ppm) as compared to 10.18 ppm and 12.33 ppm found in lake and creek waters.

Chloride. Chloride ion concentration varies from 32 mg/l at the headwater of Cold Creek (Station 12) to 158 mg/l near the confluence of Cold Creek and Malibu Creek (Station 23). These are relatively low, acceptable levels. In Malibu Lagoon the concentration of chloride ion ranges between 18,000 mg/l to over 20,000 mg/l.

TABLE 22

WATER QUALITY OF MALIBU CREEK

	Station	Hardness mg/l	TDS mg/l	Chloride mg/l	Nitrate mg/l	Rock Types
Upstream	3	255	640	73	NA	Siliceous and Calcareous Shales, Cherts, and Sandstone
Central Reaches	7	713	1,900	139	0.563	Volcanic-basalts and andesite
	23	588	1,396	158	0.886	
Lower Course	9	640	1,464	149	0.558	Conglomerate, sandstone, and basalts
	10	879	4,120	1,607	NA	
	14	NA	39,522	20,345	NA	
	13	NA	48,738	18,494	NA	

WATER QUALITY OF COLD CREEK

	Station	Hardness mg/l	TDS mg/l	Chloride mg/l	Nitrate mg/l	Rock Types
Upstream	12	321	500	32	0.086	Sandstone, Shale, and Cherts
Central Reaches	11	488	1,022	73	0.035	Basalt, andesite flows, tuffs,
	8	550	1,028	74	NA	braccias interbedded with sediments
Lower Course	23	588	1,396	158	0.886	Conglomerate, sandstone, and basalt
	9	640	1,464	149	0.558	

Source: Earl S. Flowers, Ph.D., School of Public Health, UCLA.

Other Elements. The waters in the area have low iron concentrations, ranging from 0.002 to .080 ppm. Calcium and magnesium ion concentrations increase downstream in most of the creeks in the area. In Malibu Lagoon the concentrations are much higher than in any other parts of the study area. Nitrate concentration is generally low with 0.563 mg/l, found at Station 7, below the Las Virgenes Treatment Plant. South of the confluence of Cold Creek and Malibu Creek it increases to 0.886 mg/l.

Field data was collected between July and August, 1971, the driest months in southern California. It is probable that most of the environmental variables examined would have seasonal variations. Therefore, only assumptions but not definitive conclusions can be made regarding water quality of the Malibu watershed.

The Regional Water Quality Control Board has also published an analysis of the Malibu Area contained in Table 23.

The Regional Water Quality Control Board has estimated the rates of various constitutents within the flow of several streams in the Region including Malibu Creek. This estimate is shown in Table 25. The summary of constituent mass emission rates for combined wet and dry weather runoff is an extrapolation of information collected in samples during both seasons correlated to the total stream volumes. These flows also include Tapia effluent discharge.

The Department of Water Resources has collected data on water quality of Malibu Creek in the general area of Crater Camp (Station 1 on Figure 27) since 1954. These records show consistently low figures for nitrate concentrations ranging from .5 mg/l to 6 mg/l averaging 2.5 mg/l for samples taken between March 1954 and October 1961 regardless of flow. Total solids during this same period average 1080 mg/l and Electroconductivity 1371 EC x 10^6 micromohos. The records are less complete for 1962 through 1964, however, a significant increase in nitrates to 17.5 mg/l was observed with marked decrease in total solids to 540 mg/l and electroconducitivity to 730 EC x 10^6. No explanation can be made for these changes in this period. Information regarding other constituents such as BOD, COD, TDS, DO are not available.

TABLE 23

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT, NONURBAN STORMWATER QUALITY ANALYSES

Location	Date	BOD (mg/l)	D. O. (mg/l)	TDS (mg/l)	SS (mg/l)	Total Solids (mg/l)	EC x 10^6 Micromhos	Nitrates (mg/l)
Malibu Creek at Cold Creek Near Mouth	11-11-72	2	6.7	1,440	6	1,446	1,920	21
	11-16-72	5	7.6	1,370	146	1,516	1,680	14

BOD -Biochemical oxygen demand

DO - Dissolved oxygen

TDS - Total dissolved solids

SS - Suspended solids

EC - Electroconductivity

This information is assumed to include flows of Tapia WRF effluent.

Source: Regional Water Quality Control Board

TABLE 24

SUMMARY OF CONSTITUENT MASS EMISSION RATES FOR COMBINED WET AND DRY WEATHER RUNOFF

Item	Malibu Creek (Station 1)
Waste Load, Tons/Yr	
BOD_5	61.8
C. O. D.	3,179
Total Solids	26,124
Oil and Grease	29.2
Dissolved Silica	211.7
Total Nitrogen	145
Phosphate P	41.5
Total Organic Carbon[a]	37.6
Phenols	0.5
Cyanide	1.51
Detergent (MBAS)	1.72
Chlorinated Hydrocarbons	0.0074
Dieldrin	0.0003
Total PCB	0.0042
Total DDT	0.0026
Heavy Metals, Tons/Yr	
Silver	0.08
Cadmium	0.19
Cobalt	1.39
Chromium	4.50
Copper	3.11
Mercury	—
Nickel	3.97
Lead	2.97
Zinc	9.19
Iron	0.15
Manganese	43.08

[a] Mass emission rates for wet weather flow only.

Source: Regional Water Quality Control Board

In 1971 LVMWD monitored Malibu Creek at five sampling stations (Stations 25 through 29, see Figure 27) and produced a yearly summary, shown on Table 26. The only data possible to correlate to the DWR data for Malibu Creek 1954 to 1961 is that of pH which has remained consistent.

Analyses of LVMWD annual reports for 1972 and 1974 reveal trends of increase in average coliform MPN upstream to greater than 240; Station 26 and 27 remaining constant; Stations 28 and 29 showing increases of about 200 percent. Fecal coliforms averages have increased to 350 at Station 25; decreased to 94 at 26; increased to 94 at 27; increased to 110 at 28, and increased to 540 at 28. Fecal Streptococcus averages have decreased through all stations except 29 where it has fluctuated and remained the same. Nitrate averages have remained relatively stable with the exception of the Station 25 which has shown a marked increase from 0.7 to 4.9 from 1971 to 1974. Temperatures have been lowered through all stations by nearly 10°F with the exception of Station 29 which was lowered 7°F. Phosphates have decreased generally again with the exception of the Station 25 which has increased from .09 to 2.7 from 1971 to 1974. No information is available to compare trends in BOD, COD, TDS and other constituents during this period.

Complete summaries of effluent analysis from Tapia are available from the District for the years 1971 through 1975. It is not possible to correlate due to the differing periods of times when sampling has been done at the various sampling points and the variability of the factors. A review of the analysis of Tapia effluent being discharged during this period shows a general consistency as would be expected as no changes in treatment level of plant operation has been made during this period.

In evaluating this data as to anticipated use, mainly contact and non-contact recreation, we find that accepted standards vary for the bacteriological quality of surface water used for body contact sport in the United States from coliform counts of 50 to 2,400 most probably number per 100 ml. The 1968 National Technical Advisory Committee made the following recommendation:

> "Fecal coliforms should be used as the indicator organism for evaluating the microbiological suitability of recreation waters. As determined by multiple-tube fermentation or membrane procedures and based on a minimum of not less than five samples taken over not

TABLE 25

LAS VIRGENES MUNICIPAL WATER DISTRICT

MALIBU CREEK MONITORING DATA - YEARLY SUMMARY

Annual Average Values From Monthly Sampling Data

Item	Station 25			Station 26			Station 27			Station 28			Station 29		
	1971	1972	1974	1971	1972	1974	1971	1972	1974	1971	1972	1974	1971	1972	1974
pH Value	8.3	8.0	8.2	7.7	7.8	8.0	8.3	8.2	8.3	8.5	8.3	8.3	8.2	7.3	8.3
Dissolved Oxygen, mg/l	11.9	9.5	12.4	7.5	8.5	9.5	11.5	10.7	12.2	14.8	11.7	12.2	11.7	9.4	10.6
Phosphate, mg/l	.09	1.5	2.7	9.8	1.9	4.7	5.5	2.1	3.4	5.1	2.0	3.3	1.9	1.5	2.1
Temperature, ^{o}F	72	64	59	68	64	58	66	63	58	67	64	58	68	66	61
Nitrate-Nitrogen, mg/l	.7	4.1	4.9	4.7	4.0	5.4	3.5	1.5	4.0	3.4	1.4	4.0	1.5	.6	2.6
Settleable Solids, ml/l	<0.1			<0.1			<0.1			<0.1			<0.1		
Coliform, MPN	240	160	2400	1600	1600	1600	350	240	350	280	920	920	350	1600	920
Fecal, MPN	17	170	350	240	94	94	27	33	94	49	130	110	350	540	540
Fecal Streptococcus, MPN	280	110	110	540	220	49	79	23	46	140	34	110	170	79	170

Source: LVMWD Report 1042, 1060, and 1114.

> more than a 30-day period, the fecal coliform content of primary contact recreation waters shall not exceed a log mean of 200/100 ml, nor shall more than 10 percent of total samples during any 30-day period exceed 400/100 ml."

The State Department of Health has as their bacteriological standard for water contact sports area a limitation of coliform count less than 1,000 per 100 ml., with not more than 20 percent of the samples taken from any sampling station in any 30-day period exceeding 1,000 per 1,000 ml, and no single sample when verified by a repeat sample, taken within 48 hours shall exceed 10,000 per 100 ml.

Ground Water

The Malibu Hydrographic Unit is roughly described by water bearing geologic properties shown in Figure 28.

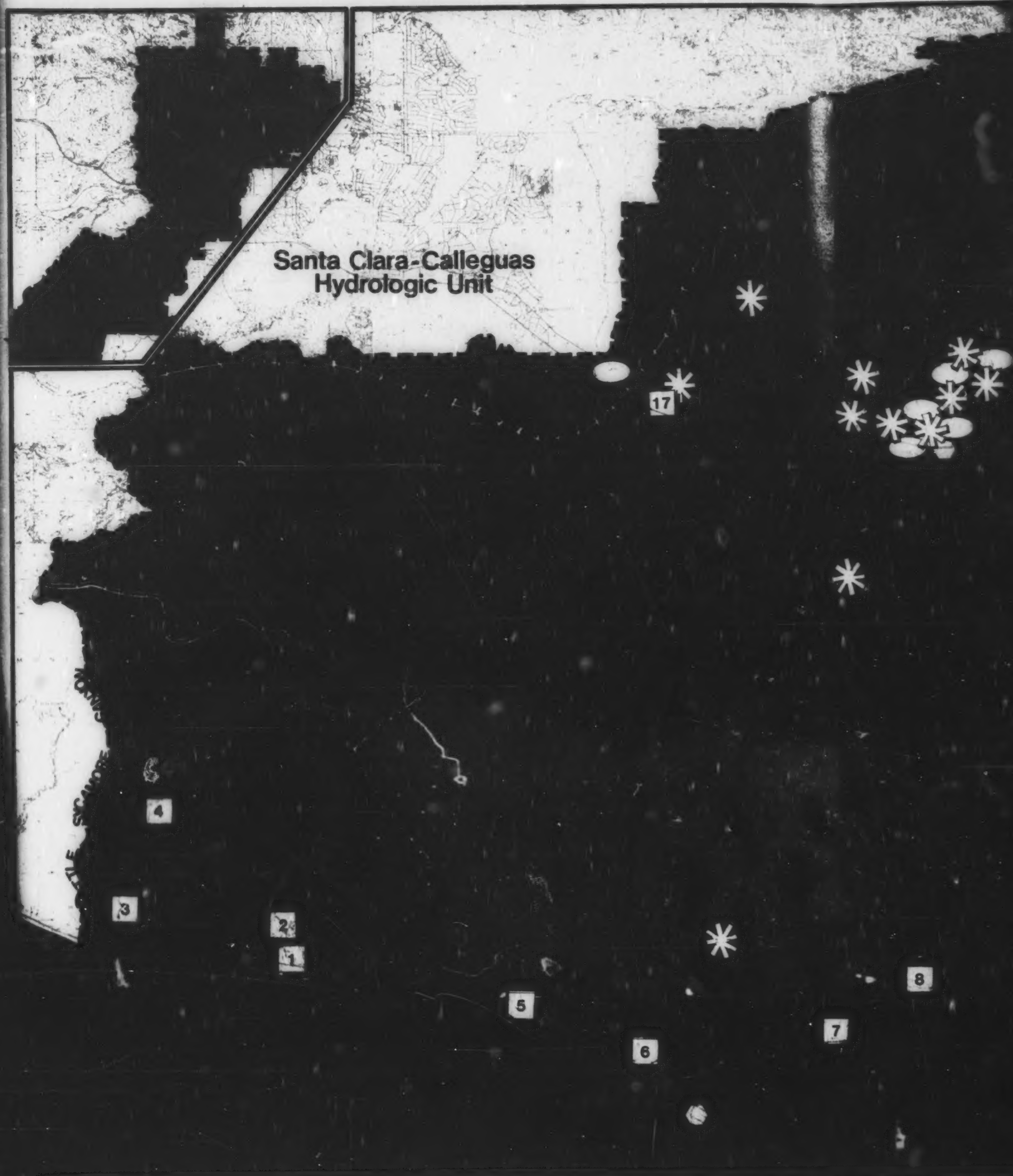
Within this framework the hydrologic unit, subunits and subareas representing the smallest scale of ground water basins that can be plotted are shown.

Ground water and surface water are integrally related and often interchange. When the water table is higher than adjacent streams, ground water will seep into the stream channel. Surface water, on the other hand, will recharge the ground water supply when the water table is below the surface water table. This condition may occur in a permeable valley fill or alluvial deposits along a stream.

Although the ground water supplies of the study area are important to those tapping them, they are rather small in comparison with other areas within the Los Angeles Basin.

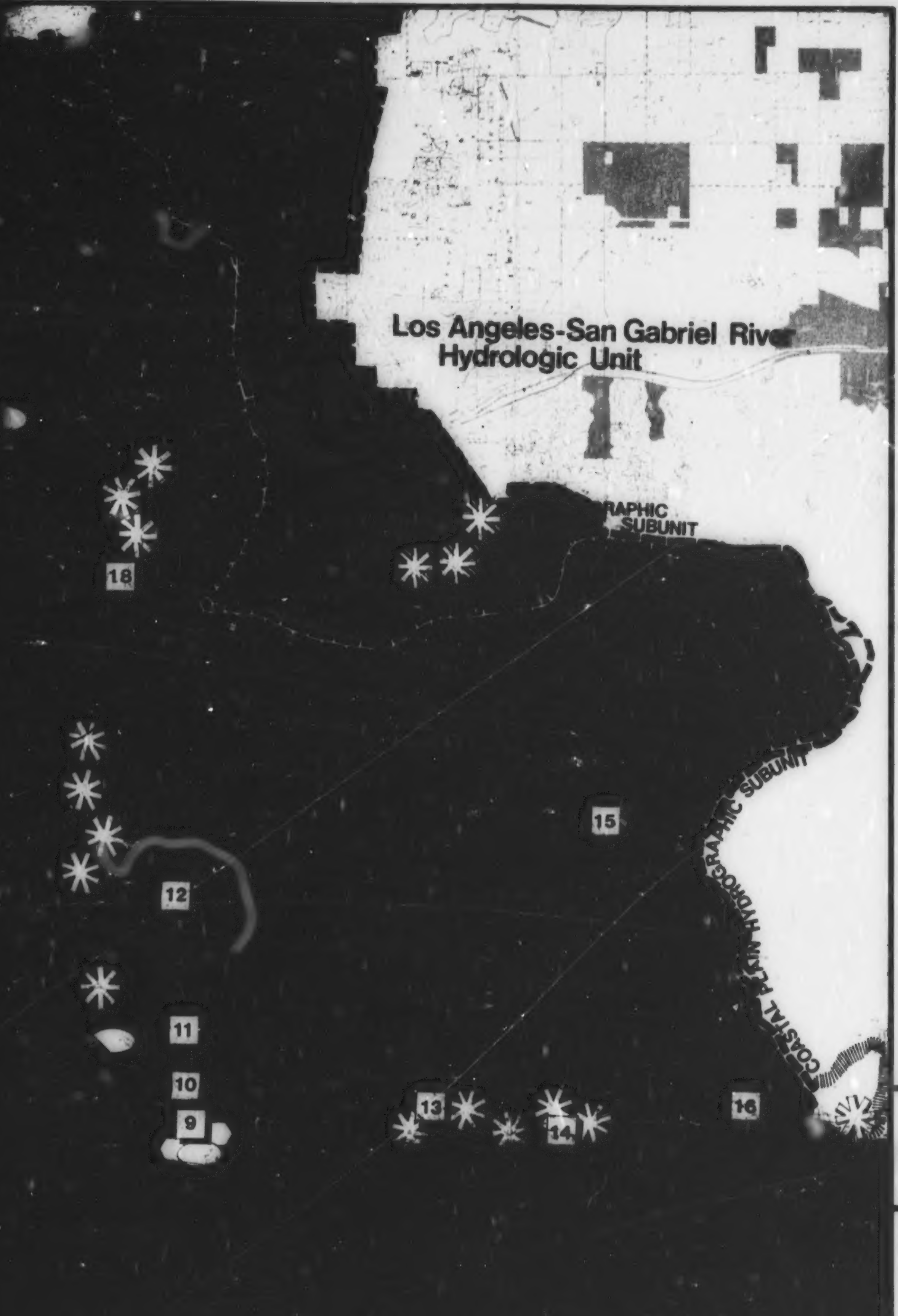
The ground water in the study area is controlled both in quantity and quality by the geology of the area. The water quality control plan for the region notes that sulfate concentrations, as well as certain other constituents, are high and regards them as "natural" conditions. Figure 28 depicts areas exhibiting these properties.

The study area, located primarily within the Malibu Hydrographic Unit (the northeastern most corner falling within the San Fernando Hydrographic Subunit) is comprised primarily of sedimentary formations and volcanic rocks. The Santa Monica Mountains are the predominant geologic feature and are essentially a broad anticline that has been extensively intruded by sills and dikes and severely faulted.


Santa Clara-Calleguas
Hydrologic Unit
TLE SYCAMORE CANYON
17
4
3
2
1
5
6
7
8

EIS/EIR

Las Virgenes-Triunfo
Malibu-Topanga
Area Wide Facilities Plan


Los Angeles-San Gabriel River
Hydrologic Unit
RAPHIC
SUBUNIT
COASTAL PLAIN HYDROGRAPHIC SUBUNIT
18
15
12
11
10
9
13
14
16
well
hydrologic subunit
hydrologic subarea
sulfates>500mg/l
nitrates>45mg/l
chlorides>500mg/l
TDS>500mg/l
key to inset
North
0
1000'
5000'
2000'
0
3000'
Scale

groundwater

fig. 28

2-63-A

Portions of the study area are comprised primarily of shales with sandstone beds and lenses. Shales tend to weather to very clayey, weak, unstable soils of poor subsurface drainage and any locally derived water supply is likely to be hard and saline.

The dominant sandstone beds within the area do not develop a sufficiently cohesive soil to be retained on the steep slopes. Consequently, they form extensive bare outcrop areas.

In the northern portion of the study area there are some thick sandstone beds which are said to be aquifers and contain water of acceptable quality. The structure indicates that most of the ground water in these aquifers is ultimately carried out of the Malibu Area water shed and into the ground water basins of Los Angeles or Oxnard.

Areas of volcanic formations vary greatly in their hydrologic properties; they commonly form good to excellent aquifers, however, the weathered volcanics in the area are generally considered poor aquifers.

In order to enable objective analysis of pollutants, an evaluation of natural features influencing ground water quality has been prepared by the Regional Water Quality Control Board. (See Table 26.)

The Water Quality Control Plan has indicated that ground water within the study area is of relative unimportance due to limited quantity and poor quality for any potential domestic use and by the availability of imported water. The ground water quality problems in the area are mainly of high total dissolved solids content. In the lower reaches of the hydrographic unit, sea water intrusion caused by overpumping of the ground water and sustained drought has occurred.

Table 27 indicates the classification of basins with regard to water quality objectives of the plan and shows a maintenance of present use.

The primary source of ground water in the area is precipitation. It is replenished seasonally by direct infiltration within deposits of soil and talus that mantle the hillsides and into deposits of alluvium that underlie the canyons. Secondary sources originate by infiltration of imported water that is applied to lawns and gardens in the urban areas. This oocurs mainly in residential areas along the coast and in Russell and Lindero Valley. Additional infiltration occurs

TABLE 26

INFLUENCE OF GEOLOGIC FORMATIONS ON GROUNDWATER QUALITY

Constituent Present in Undesirable Concentrations	Responsibility of General Category for Presence of Constituent in Undesirable Concentrations	
	Local Natural Geologic Formations	Other Causes
TDS	Fairly frequent	Fairly frequent
TH	Fairly frequent	Fairly frequent
Cl	Occasional	Frequent
NO_3	Infrequent	Nearly exclusively
Fe	Nearly exclusively	Infrequent
Mn	Nearly exclusively	Infrequent
CO_2	Frequent	Occasional
H_2S	Exclusively	None
CH_4	Frequent	None
"Organics"	Exclusively	None
Color	Exclusively	None
Taste and Odor	Nearly exclusively	Infrequent
"Pollution"	None	Exclusively
F	Exclusively	None

Source: Regional Water Quality Control Board

TABLE 27

CLASSIFICATION OF WATER SEGMENTS WITHIN BASIN

Category and Name of Water Segment b/	WQ Objectives Met		Segment Classif.	Remarks
	1974	7/1/77		
Groundwater Basins				
Topanga	Yes	Yes	"	Minor domestic water use.
Malibu Creek	Yes	Yes	"	Minor domestic water use.
Las Virgenes	Yes	Yes	"	Negligible domestic water use.
Lindero Cyn.	Yes	Yes	"	Minor domestic water use.
Russell Valley	Yes	Yes	"	Minor domestic water use.
Sherwood	Yes	Yes	"	Domestic water use for Hidden Valley and vicinity.
Point Dume	Yes	Yes	"	Minor domestic water use.
Camarillo	Yes	Yes		Minor domestic water use. No imported water available.

Source: Regional Water Quality Control Board

from seepage losses from reservoirs and possibly from spray irrigation disposal of effluent. Spray irrigation of effluent from Tapia WRF is presently disposing 1,250,000,000 gallons of water per year. It has been found that spray irrigation of Tapia effluent varies from area to area and has had successful irrigation rates of from 23,000 to 150,000 gallons per hour per acre for short periods of time[1]. The rates and amounts of water infiltration from all sources, however, are not known due to lack of reliable data.

Private and semi-private wells are scattered throughout the study area. Distribution along the coast is limited to the higher reaches of the coastal canyons, such as Trancas, Ramirez, Escondido, Solstice, Puerco and Flores. Exceptions are wells located along the immediate coast at Carillo State Beach and several others used for irrigation purposes. Wells are more widely distributed inland with privately operated wells being maintained at points along Mulholland Highway from the head of Arroyo Sequit to Saddle Rock. Concentrations of wells occur around Lake Sherwood, the Triunfo Canyon-Seminole Hot Springs-Malibu Lake area, Agoura, Cornell Road from Malibu Junction to Malibu Lake, Las Virgenes Valley, Calabasas Highlands, Century Ranch, and the Monte Nido area.

Many wells are used in conjunction with municipally supplied water, while others in the more remote areas represent a singular source of water. Records of locations and amounts of use are nonexistent, as is water quality data; however, based on the observations of the County Health Offices of Calabasas and Malibu which serve the area, and their cumulative experience in the area, there have been virtually no bacteriological and moderate chemical problems associated with water extracted for the purpose of human consumption.

Ground Water Levels

Ground water quantity information within the study area is incomplete. Detailed analysis of the basins in regard to capacity and recharge rate of the aquifers has never been done. Sketchy information regarding water levels in wells in the area is available through the County Flood Control District; however, this information is also incomplete and not necessarily correlated by season. The quantity of ground

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1. Las Virgenes Municipal Water District, Spray Irrigation Records, October, 1975.

waters within the study area vary considerably with season and it is of little value in predicting trends to compare an October measurement with February measurement.

The following is a cross section of available data regarding water elevation in wells. (See Figure 28 for well locations.)

In summary, the Regional Water Quality Control Board states that there are no prospects for watershed management as a means for supply augmentation in this area. The mountain watersheds are too low and the potentials for harvesting runoff too limited for weather modification to be a factor in this area. Further expanded conjunctive use of ground water and imported water is not a possibility. Ground water development and use is quite limited since the quantity of ground water is naturally low.

WATER ELEVATION IN WELLS
(See Figure 28 for Well Locations)

Well location number	Ground surface elevation (ft.)	Distance to water surface	Date
1	110	10	56
2	401	100	70
		123	4/74
3	54	20	4/55
		25	12/55
		25	4/64
		7	4/65
		24	11/74
		8	4/74
4	275	13	5/62
		17	4/64
		10	11/74
		7	4/75
5	23	19	12/57
		18	12/62
		16	11/74
		9	4/75
6	54	55	12/60
		45	12/63
		33	11/74
		32	4/75

WATER ELEVATIONS IN WELLS
(continued from preceeding page)

Well location number	Ground surface elevation (ft.(	Distance to water surface	Date
7	126	41	12/58
		54	12/63
8	125	45	11/57
		45	12/63
9	14	11	12/56
		9	12/63
		6	11/74
		6	4/75
10	65	44	12/58
		39	11/65
		12	11/74
		12	4/75
11	80	16	11/65
12	476	12	2/57
13	73	22	12/55
		20	12/61
14	218	69	11/64
		63	4/75
15	750	56	12/55
		75	12/60
16	20	26	12/59
		18	12/62
17	975	overflowing	3/57
18	705	40	12/58
		48	12/63

2.2.6 Geology and Seismicity

Geology

General Geology

The western Santa Monica Mountains are underlain by a complex sequence of sedimentary and igneous rocks formed under intermittent continental and marine conditions since Upper Cretaceous time, 65 to 100 million years ago. The rocks exposed in the area vary widely in composition, texture, and structural configuration. They include coarse clastic deposits of conglomerate and conglomeratic sandstone; basaltic intrusive rocks; volcanic basalt flows, flow breccias and tuffs; thick deposits of fine grained clastic deposits; and chemical precipitates including shale, mudstone and clayey sandstone, diatomite, siliceous and calcareous shale, and chert. These rocks have been subdivided on the basis of detailed geologic mapping into at least fifteen formational units of differing age, thickness and lithology. (See Figure 29 Geologic Map, which is further explained in the Appendix.)

The depositional history of the area since Upper Cretaceous time, has been interrupted by several periods of deformation including both subsidence and uplift; hence, the formational units exhibit both lateral and vertical changes in lithology, and they are partly truncated by unconformities that represent long periods of erosion. In places, they are intricately folded and severely dislocated by faults on considerable magnitude that have been active at varous times in the geologic past.

In general, the region can be subdivided into three areas with differing geologic characteristics: 1) a coastal zone of great geologic complexity where the formational units are intricately folded and severely dislocated by faults of considerable magnitude and the lithology of the rocks is highly variable over short distances; 2) an interior mountainous region where the rocks are less structurally complicated by faulting and are of more uniform lithology, consisting dominantly of volcanic and fine to medium grained sedimentary rock types; and 3) a northern region, the Simi Hills, where the rocks are folded into a series of subparallel, westerly trending synclines and anticlines and consist dominantly of medium to fine grained sandstone, siltstone, and shale.

The most structurally complicated sequence of rocks in the area lies in the 2 to 4 mile wide coastal zone along the Malibu coastline from Topanga Canyon on the east to Sequit Point on the west. Throughout this zone, the rocks are highly folded, steeply dipping, and are offset by numersou low angle thrust faults and high angle faults that juxtapose rocks of unlike

GEOLOGIC MAP LEGEND FOR FIGURE 29

ROCK UNITS

QUATERNARY

Recent

Pleistocene

Qal Alluvium

Qb Beach Deposits

■ Landslide Deposits

Qt Nonmarine terrace deposits

Qtm Marine terrace deposits

Pliocene

TQs Saugus Formation, marine and nonmarine sandstone conglomerate, and clays; detail deposits

TERTIARY

Miocene

Upper

■ Monterey/Modelo Formations; marine shale

■ Modelo Formation; marine shale and sandstone

Middle

■ Topanga Formation; marine siltstone and sandstone

■ Upper Topanga Formation siltstone and sandstone

■ Middle Topanga Formation; extrusive volcanic rocks

■ Lower Topanga Formation siltstone and fine sandstone

■ Intrusive volcanic rock, chiefly basalt

■ Conejo Volcanics; extrusive and intrusive basalt to andesite volcanic rocks

Lower

■ San Onofre Breccia; marine siltstone and coarse sandstone

■ Volcanic rocks associated with the San Onofre Breccia

■ Vaqueros Formation: marine and nonmarine sandstone and siltstone

Oligocene

■ Sespe Formation: varicolored nonmarine sandstone

Eocene

■ Llajas Formation (?) marine conglomerate, sandstone, siltstone, and shale

Paleocene

■ Martinez Formation: marine sandstone

■ Santa Susana Formation: marine sandstone

■ Simi Conglomerate: marine conglomerate

MESOZOIC

Cretaceous

■ Upper Cretaceous rocks sometimes referred to as "Chico Formation": marine sandstone and siltstone with local conglomerate

SYMBOLS

FAULTS: faults dashed where approximate, dotted where concealed or inferred

— - - · · High angle fault

— — — · · · Low angle reverse fault, barb on upper plate

FOLDS: Folds dashed where, approximate; dotted where inferred or concealed

Syncline, showing troughline and direction of plunge

Anticline, showing crestline and direction of plunge

BEDDING:

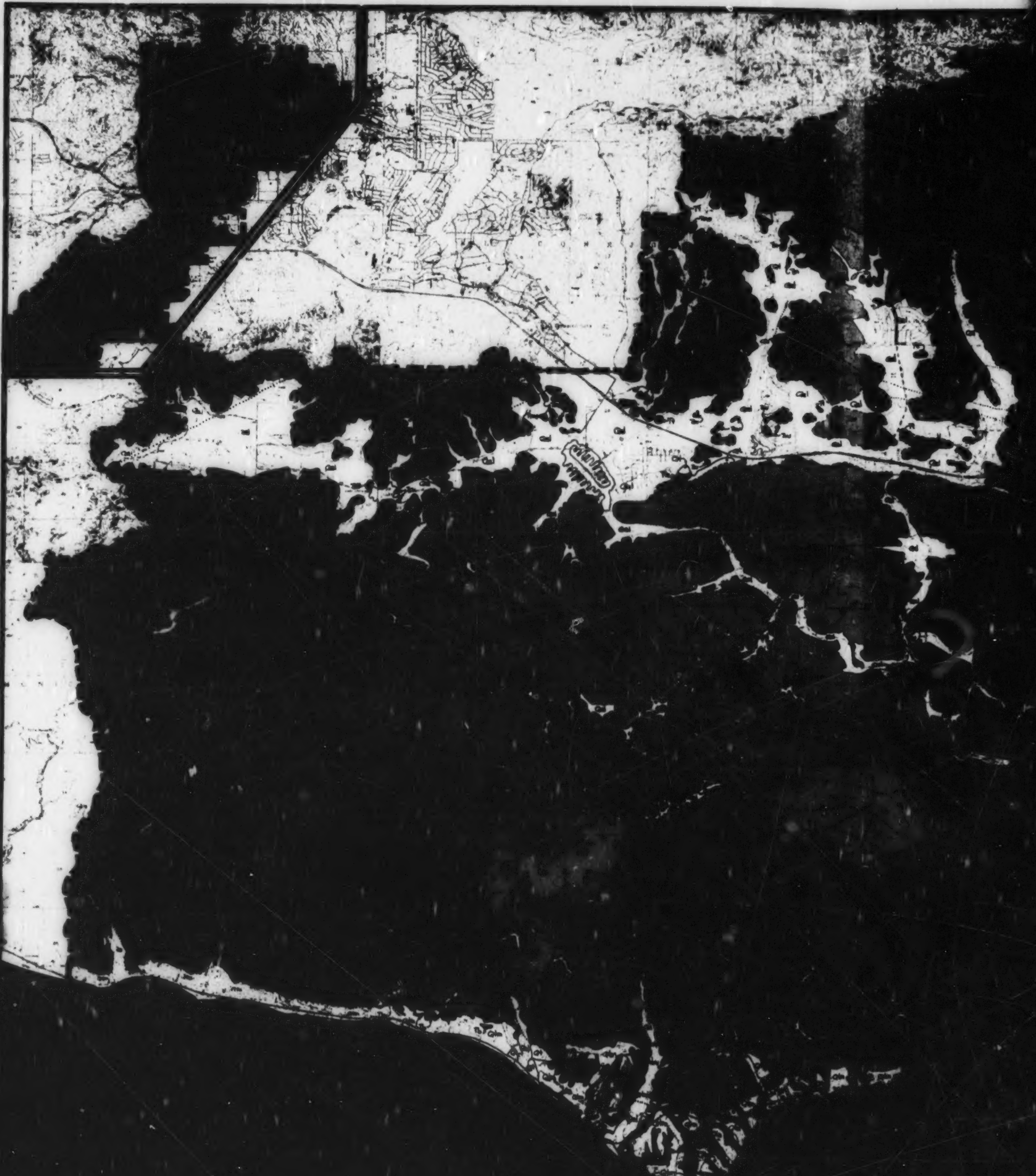
Contacts (all shown are approximate)

General strike and dip of beds

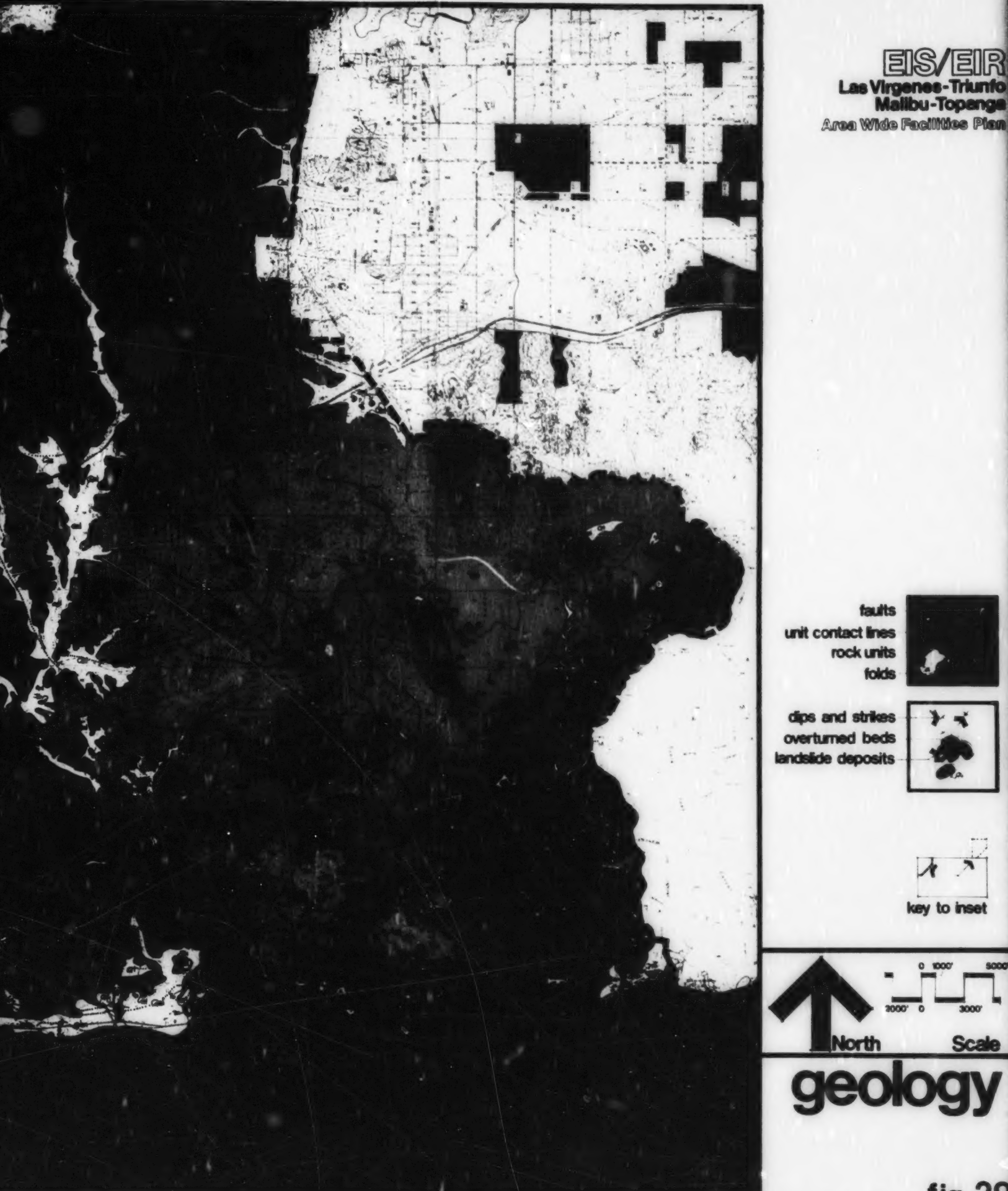
Overturned beds

LANDSLIDES:

Arrows indicate direction of movement boundaries approximate



EIS/EIR
Las Virgenes-Triunfo
Malibu-Topanga
Area Wide Facilities Plan

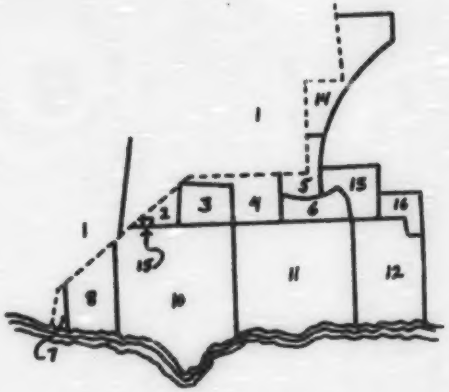

faults
unit contact lines
rock units
folds
dips and strikes
overturned beds
landslide deposits
key to inset
North
0 1000' 5000'
3000' 0 3000'
Scale

geology

fig. 29

2-71-A

KEY MAP - SOURCE LEGEND FOR FIGURE 29



1. Calif. Div. Mines & Geol;, 1972, Geo. Map of So. Ventura Co. CDMG Prelim. Rpt. 14, Pl. 1, 1:48,000.

2. R. T. Frankian & Assoc., 1966, Geo. & Soil Investig., South Hills, Albertson Ranch, L.A. & Ventura Cos. Unpub. Consulting Rpt. 1"=600'.

3. Blackerby, Bruce A., 1965, the Conejo Volcanics in the Malibu Lake Area of the Western Sta. Monica Mtns., L.A. Co., Ca. UCLA, Unpub. PhD, scale 1:12,000.

4. Elam, Jack G., 1948, Geol. of the Seminole Quad., L.A. Co., Ca. UCLA, Unpub. MA, 1:20,000.

5. Brown, George E., 1957, Geol. of Parts of the Calabasas & Thousand Oaks Quads, L.A. & Ventura Cos., Ca. UCLA, Unpub. MA, 1:18,000.

6. McGill, John T., 1948, Geol. of a portion of the Las Flores, & Dry Canyon Quads., LA Co., Ca. UCLA, Unpub. MA. scale 2-3/8"= 1 mile (approx).

7. Sonneman, Howard S., 1956, Geol. of the Boney Mountain Area, Sta. Monica Mtns., Ca. UCLA, Unpub. MA. 1:12,000.

8. Guynes, George E., 1959, Geol. of the Triunfo Pass Area, LA & Ventura Cos. Ca. UCLA, Unpub. MA. 1:12,000.

9. Campbell, R. H., 1968, Prelim. Geol. Map of Part of the Triunfo Pass & Point Dume Quads., LA Co., Ca. USGS Open-File Map. 1:12,000.

10. Campbell, R. H.; Et Al., 1970. Prelim. Geol. Map of the Point Dume Quad., LA Co., Ca. USGA Open-File Map. 1:12,000.

11. Yerkes, R.F.; Et Al., 1971, Prelim. Geol. Map of the Malibu Beach Quad., LA Co., Ca. USGA Open-File Map. 1:12,000.

12. Yerkes, R. F.; Et Al., 1973, Prelim. Geol. Map of the Unincorporated Part of the Topanga Quad., LA Co., Ca. USGS Open-File Map. 1:12,000.

13. Soper, E. K., 1938, Geol. of the Central Sta. Monica Mtns., LA Co. CDM, 34th Rpt. St. Min., V. 34, No. 2, Plate 1, 1:36,000.

14. Conrad, Stanley D., 1949, Geol. of the Eastern Por. of the Simi Hills, LA & Ventura Cos., Ca. UCLA, Unpub. MA, Approx. 1:30,000.

15. Soil Mechanics & Foundation Engineers, 1969, Eng. Geologic and Soil Engineering Design, Inv. for Westlake Reservoir, Unpub. Consulting Report 1"=400'.

16. Hoots, H. W., 1930, Geology of the Eastern Part of the Santa Monica Mtns., LA Co. USGS Prof. Paper 165, 1:24,000.

ADDITIONAL DATA FROM:

- Durell, Cordell, 1954, Geol. of the Sta. Monica Mtns. LA & Ventura Cos., CDMG Bull. 170, Map Sht. 8,1"=2miles (approx)
- Jennings & Strand, 1969, Geol. Map of Ca.,LA Sheet. CDMG, 1:250,000.
- KEW, W.S.W., 1924, Geol. & Oil Res. of a part of LA & Ventura Cos., Ca. USGS Bull. 753, 1:62,500.
- Boyle Engineering

types and ages in many places. The thrust faults exhibit arcuate and circular traces in mountain parts of the coastal zone. Many of the high angle faults in the area are truncated by the thrust faults and by the largest and youngest fault in the area, the Malibu Coast fault. The high angle faults strike northerly toward interior parts of the area. The Malibu Coast fault strikes westerly, and its trace is near and parallel to the coast from the vicinity of Carbon Beach on the east to Sequit Point on the west. Rocks of practically all ages, except the very youngest, the alluvium, are ruptured along the coast by this fault. Most of the faults and related structures in the coastal zone have not had a pronounced influence upon topography. However, the Malibu Coast fault is an exception. In most places, the trace of this fault coincides with the pronounced change in slope between the coastal terrace and the base of the Santa Monica Mountains.

In the central and western interior parts of the area, the rocks are less severely deformed than they are in the coastal zone. In most places, the rocks strike westerly and dip 20 to 40 degrees northward. However, in the eastern interior, the rocks are moderately folded and broken by high angle faults which are exposed for several miles along strike. The folding and associated faulting in this area extends northwesterly in an arcuate pattern from the interior edge of the coastal zone of complex structures toward the Simi Hills. In the Simi Hills, the beds are folded in a series of closely spaced subparallel anticlines and synclines that trend westerly toward the urbanized area of Thousand Oaks.

Erosion of the consolidated rocks in the study area has resulted in the accumulation of detrital materials in the form of talus cones, alluvial fans, valley fill, stream deposits, and terrace gravels. The processes of mass wasting have produced numerous landslide deposits in mountainous parts of the coastal zone. Alluvial fans, valley fill, and stream deposits are localized along streams and adjacent hillsides throughout the area, but they are most extensive along Malibu Creek and its tributaries in the interior mountainous regions. The terrace gravel covers a series of bench-like surfaces stepped at various elevations parallel to the coast.

Inland, the detrital materials are transported seaward by Malibu Creek and the coastal streams. When they reach the sea, they are reworked by ocean currents and redeposited on beaches and on the sea floor. In the past, the area has also been subjected to a succession of environmental changes which included regional uplift and changes in climate and in sea level. These changes have been accompanied by periods of accelerated erosion in the area so that the detrital materials have been reworked many times. The chronology of these events is complex, and hence, the deposits are stratified in complex ways; their thickness and internal composition is variable from place to place, and in some places, deposits of one origin grade laterally into deposits of different origin.

The distribution of the most significant of these deposits is shown on the Geologic Map. For the sake of clarity, the alluvial fan and valley fill deposits are combined and illustrated as a single unit --the alluvium. Other units of importance to environmental studies in the area are the beach deposits, the landslide deposits, and the marine terrace deposits. Pertinent details concerning the properties of each unit are summarized in Appendix of this report.

Effluent Disposal and Geologic Conditions

In general, the geologic environment offers limited opportunities for effluent disposal systems. Many of the geologic units contain expansive clay which acts to reduce transmissibility potential of the various rock and soil materials. There are, however, some materials which have fewer limitations for effluent disposal. These are generally located in areas of flat to gentle slopes such as valley bottoms and coastal or inland terraces. Valley-filling and terrace deposits contain materials which have adequate thickness, infiltration and transmissibility characteristics, and grain size distribution, and can be used for both private or public sewage disposal systems.

Geologic constraints include, in addition to the landslides which are discussed separately, the occurence of fine grained, relatively tight rocks which occur in the rugged terrain of the Santa Monica Mountains and the Simi Hills, and the fine grained soils developed on most units throughout the area. Geologic opportunities include some of the locally permeable rocks, such as some sandstone beds of the Sespe Formation, and the Upper Topanga Formation, and some of the volcanic rocks in the Goat Buttes area of Triunfo Canyon. In addition, extensive and relatively thick (generally less than 20 feet thick) marine terraces along the Malibu Coast contain adequate materials which are more pervious than those of continental, inland terraces. The alluvium deposits of valleys constitute opportunities as well where not excessively coarse grained or pervious or excessively fine grained and impervious. Disposal of effluent by spray irrigation can be accomplished in valleys which have appropriate soils. These are identified in the Soils chapter of this report.

Individual septic tank systems can be successfully implemented and operated in parts of the study area. Unfavorable geologic conditions for such systems include fissures rock formations and very coarse grained gravels, since they do not filter the effluent to remove pathogenic organisms. Systems near rivers or at the beach can fail by river or ocean flooding. In addition, systems may fail by saturation in areas with a high groundwater table, or where the groundwater table rises due to seasonal fluctuations or to be construction of a large number of nearby systems, which interfere with each other. Alteration of the infiltration capacity of the rock or soil in which the system is installed by swelling clays, plugging of the voids by solids, biological plugging, physical breakdown of the materials by wetting and drying, are all factors that will contribute to the failure of the system. Excessive slopes (generally regarded as those exceeding 20 percent grade) should be avoided where possible to prevent downhill surfacing of the effluent (A. L. Franks). Detailed investigations to determine extent of adequate rock and soil materials for an individual system should precede its design. In addition, construction should be performed according to the state-of-the-art and following local codes. Finally, operation should be such that the system is not overtaxed.

Slope Stability

The combined factors of complexly deformed clay-rich rock, narrow canyons with steep stream gradients and infrequent but intense periods of rainfall contribute to the high concentration of landslides in the study area. (Refer to Relative Slope Stability Map, Figure 30.) Sedimentary rocks, which occupy approximately 70 percent of the study area, have the highest potential for future stability problems. Most of the confirmed and suspected landslides occur in areas underlain by these rocks. The preponderance of fine grained, relatively weak sedimentary rock units and bedding planes oriented approximately parallel to natural slopes create conditions favorable for future landslides. Bedding plane failures are a common response to these conditions. Many of the landslides shown on Figure 30 are bedding plane failures that are considered inactive but may be subject to renewed activity under conditions favorable for movement, such as seismically induced ground shaking, heavy precipitation, or man-made alterations.

Mountainous terrain in the coastal zone is usually subject to surficial slope failure as well as massive bedrock movements because of its characteristically thin soils and the periodic removal of protective vegetation cover by fire. Fire exposes the materials to erosion and water infiltration, thus reducing the strength of the soils and increasing the potential for sliding. In the study area, the soils are generally shallow, and contain abundant clay in both volcanic and sedimentary terrains. Clay soils are relatively impervious and may be easily eroded if unprotected by vegetal cover. Thin clay soil slumps and creeps slowly downslope as evidenced by hummocky hillslopes and downhill-bending plant stems found throughout the study area. During heavy rain storms, this process accelerates causing mud and debris flows on unprotected slopes. This problem was particularly acute during the floods of January and February 1969.

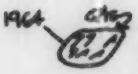
Poor construction practice on potentially unstable slopes may result in large scale failure or minor failures requiring constant maintenance. For example, many of the cut slopes on Point Dume Road are failing because they undercut adversely oriented, fine grained sedimentary beds. (Personal communication, Jim Padick, Los Angeles County Engineering Geologist, April 1974.)* A landslide on Latigo Canyon Road is causing continual road maintenance problems and will continue to do so as long as the road crosses the headscarp of the slide. Road work along the horseshoe bend of Encinal Canyon Road was partially responsible for a recent slope failure in that area, although effluent from a seepage pit in the slide mass may have been a contributing factor also. (Personal communication, Dick Ramirez, Los Angeles County Engineering Geologist, April 1974.)*

Active landsliding at Latigo Shores, Amarillo Beach, and Puerco Beach is a natural result of wave erosion along the coastal bluff areas. The Latigo Shores slide has been active since 1929. It is being monitored for movement by the U. S. Geological Survey. Measurements indicate that the slide movement accelerates immediately after heavy rainfall. No structures for human occupancy should be allowed in an area like this. Even if stabilization measures were to be taken, it would be necessary to keep the area from becoming saturated with moisture. However, the Los Angeles County Engineering Geology Section has adopted a policy of refusing building permits in this area if no provisions for off-site sewage disposal have been made in the development plans. (Personal communication, Dick Ramirez, April 1974.) * This policy is intended to protect the public from creating a landslide hazard by saturating unstable soil and geologic units.

Areas of potential slope instability should be investigated in detail prior to construction to determine whether adverse conditions can be improved satisfactorily. Methods of improving slope stability include dewatering by installing drainage devices, constructing appropriate slope gradients, removing and redistributing unstable masses, buttressing unstable slopes with compacted soil or with retaining walls, maintaining an adequate vegetal cover on cuts and fills, etc.

(*) From Boyle Engineering's report.

RELATIVE SLOPE STABILITY MAP LEGEND FOR FIGURE 30



Landslide deposits, suspected or confirmed; arrows indicate direction of movement; queried where uncertain; date shown for known activity.

4 Areas very susceptible to landsliding, rockfalls, and slumping.

3 Areas moderately susceptible to landsliding, rockfalls, and slumping.

2 Areas of low susceptibility to landsliding, rockfalls, and slumping.

1 Stable areas (generally flat)

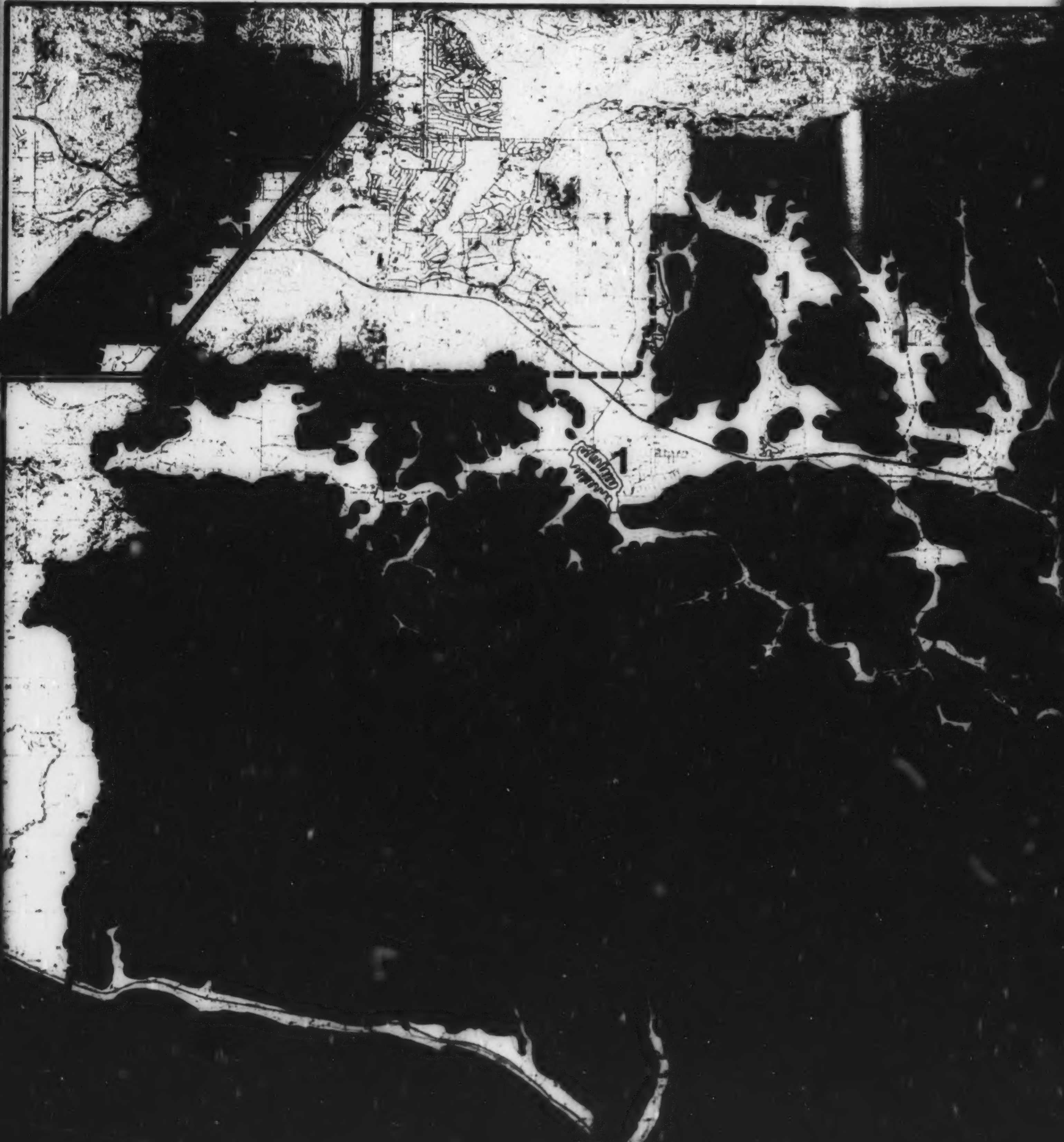
MAP SOURCES FOR FIGURE 30

Earth Sciences Associates, 1975, Geologic Map of the Study Area (compilation)

Department of the Los Angeles County Engineer, Engineering Geology Section, 1974, Seismic Safety Element of the Los Angeles County General Plan, Appendix A of the Technical Report.

Boyle Engineering, 1975, Relative Slope Stability Map of the Study Area (Plate 3)

Russell Campbell, 1975, personal communication (geologist with U. S. Geological Survey)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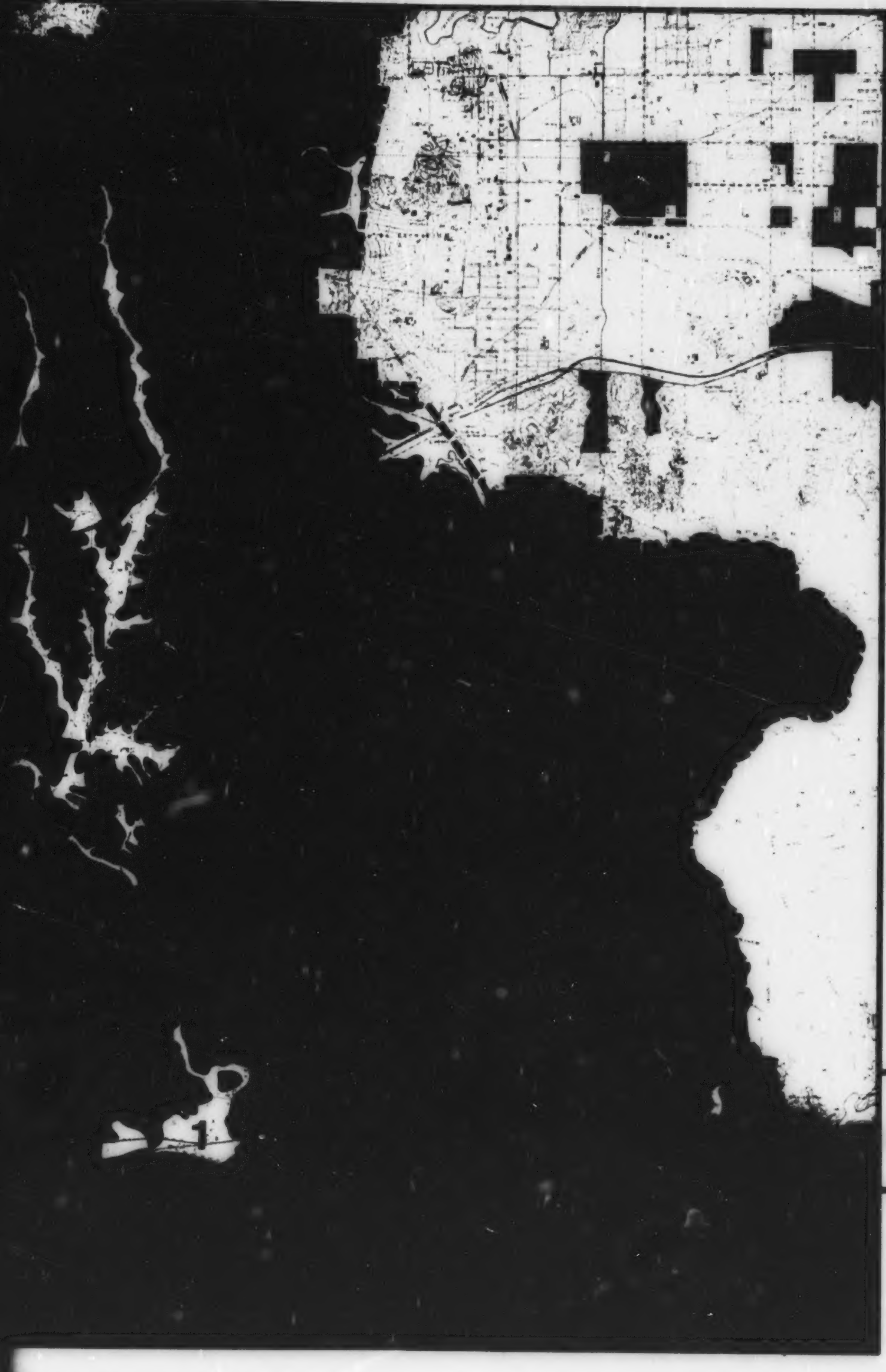

1
landslide deposits
slope stability zone
key to inset
0
1000'
5000'
2000'
0
3000'
North
Scale

EIS/EIR

Las Virgenes-Triunfo
Malibu-Topanga
Area Wide Facilities Plan

slope stability

fig.30

2-77-A

Effluent Disposal Systems and Slope Stability

The relationship between the use of seepage pits and landslides in the study area is obscure. Certainly saturation of an unstable hillslope is an established causative factor of slope failure. Consulting geologists have recognized this and made recommendations for off-site sewage disposal when development was proposed in potentially unstable areas such as Encinal Canyon, also known as La Chusa Highlands (E. C. Michaels, 1962; J. D. Merrill, 1971; unpublished consulting reports on file in Los Angeles County Engineer's office, Engineering Geology Section.) Sewage effluent may have been a contributing factor in the Encinal Canyon landslide of February 1974. However, many of the active slide problems in the study area occur in areas removed from developments served by private sewage disposal systems. Thus, the correlation between active slides and the use of septic tank systems is very low. (Personal communication, Arthur Keene, Los Angeles County Engineering Geologist, September 1975.)
Spray irrigation practices to dispose of effluent on steep slopes are hazardous, since they can decrease the stability of the soils by saturation and increased pore water pressures. Seismic shaking could induce liquefaction of unstable irrigated soils and cause landsliding.

Relative Slope Stability Map

A map showing mapped landslides and susceptibility to landsliding was prepared from a similar map in the Los Angeles County Seismic Safety Element (1974). Areas not underlain by mapped landslides were divided into four categories of landslide, rockfall and slumping susceptibility. The classification was based mainly on geologic and geomorphic criteria such as rock or soil composition, slope steepness and geologic structure, but also considered density and distribution of existing landslides and climate. The following categories were mapped.

- Mapped landslide deposits, suspected or confirmed.
- Areas underlain by materials very susceptible to landsliding, rockfalls and slumping (such as those with a high landslide density, very steep slopes, or underlain by weak materials such as the Modelo/Monterey and Rincon Formations).
- Areas underlain by materials moderately susceptible to landsliding, rockfalls and slumping (such as those with intermediate landslide density, and underlain by various geologic units).
- Areas underlain by materials of low susceptibility to landsliding, rockfalls and slumping (such as those with

very few landslides, underlain by older, stable formations such as the "Chico" Formation).

- Stable areas (such as flat valley floors and mesas).

The presence of landslides or the rating of an area as being very susceptible to landsliding, rockfalls or slumping does not indicate that engineering structures or other facilities are to be precluded from that area. Current construction techniques that take into consideration engineering geologic and soils engineering information and recommendations can successfully solve most instability problems if appropriate funding is available.

The Relative Slope Stability Map is useful in that it delineates areas of varying hazard to both human life and engineering structures. It should be used carefully for planning, and will not replace detailed site investigations for defined projects.

The map does not include specific areas subject to soil slips and mud or debris flows caused by heavy rain. These flows involve the cover of colluvial soil on steep hillsides and colluvial fill in steep ravines. Debris flows may reach avalanche speeds and deposit their detritus when they reach the lower gradients at the mouths of short, steep drainage basins tributary to broad valleys, forming debris masses in and along narrow trunk canyons below the mouths of short, steep tributaries (Russell Campbell, 1974). The storm of 1969 produced thousands of these flows in the Santa Monica Mountains. An empirical association between soil slips and rainfall suggests that ¼ inch of rain per hour is required to render soils in the area unstable after a rainfall of about 10 inches. When these conditions are reached, soils are not able to absorb and transmit any more water and become at least partly liquid when disturbed (Campbell, op. cit.). Smaller storms occur more frequently, resulting in smaller numbers of soil slips and mudflows and posing a recurring debris-flow hazard to many hillside residents.

Seismicity

The study area is in a relatively seismically quiet part of southern California, where no major earthquakes have originated in historic times. However, several moderately strong earthquakes have affected the area in the past. Figure 31 shows the distribution of instrumentally located earthquake epicenters with magnitudes of 4.0 or greater for the period 1934 to 1971; it also shows the presumed location of large earthquakes that occurred prior to 1934. In addition, the map shows the location of major earthquake faults and of faults that displace Quaternary deposits. The strongest earthquake that affected the study area recently is the 1971 San Fernando event, which had a Richter magnitude of 6.6 and caused great damage in San Fernando Valley, immediately east of the northeast corner of the area.

Earthquakes were reported in southern California from the time of the Spanish expeditions and early settlers. These early reports, however, are incomplete and do not help to piece together the seismic history of the area, except to indicate that earthquakes did occur. It was not until after about 1900 that equipment was developed to record and instrumentally locate earthquakes, and not until 1934 that systematic records were kept to begin development of a true statistical history.

Probably the most important earthquake with respect to the study area, prior to the San Fernando earthquake, was the 1857 Tejon event on the San Andreas fault. Ground rupture along the trace of the fault was reported from Cholame on the north to at least as far south as San Bernardino. From the length of rupture and the reports of shaking, the Richter magnitude of that event has been judged to be about 8.3. This earthquake was felt strongly at Ventura and in the Santa Clara Valley, and must have been strong in the study area as well.

Most moderate to large earthquakes in southern California originate on known faults. The study area is enclosed by two fault systems which could be the sources of future damaging earthquakes. These fault systems are the Malibu Coast - Santa Monica - Raymond Hill along the south edge of the area, and the Simi - Northridge - Santa Susana - Verdugo to the north. Some individual fault segments of these systems are considered to be potentially active, since they displace sedimentary deposits of Quaternary age. The most conspicuous of these is the Malibu Coast fault which is a steeply north-dipping reverse fault that generally trends parallel to the coast for many miles west from Santa Monica. Its trace coincides in part with the abrupt change in slope at the southern edge of the Santa Monica Mountains. Related faults displace terrace deposits of Upper Pleistocene (late Quaternary) age at several locations along the coastline (Yerkes and Wentworth, 1969). There are no known active faults with historic rupture in the area.

The principal effects of earthquakes that must be considered for engineering projects are ground surface rupture and sudden elevation changes, and ground-shaking effects such as liquefaction, landsliding, settlement, and slumping. Ground shaking is the most widespread and damaging effect of an earthquake. Its effects vary with distance from the epicenter, being generally less intense at greater distances. Type of bedrock and type and depth of overburden, as well as topographic setting, are important variables as well.

FAULT AND EPICENTER MAP
MAP SOURCES FOR FIGURE 31

Faults from:

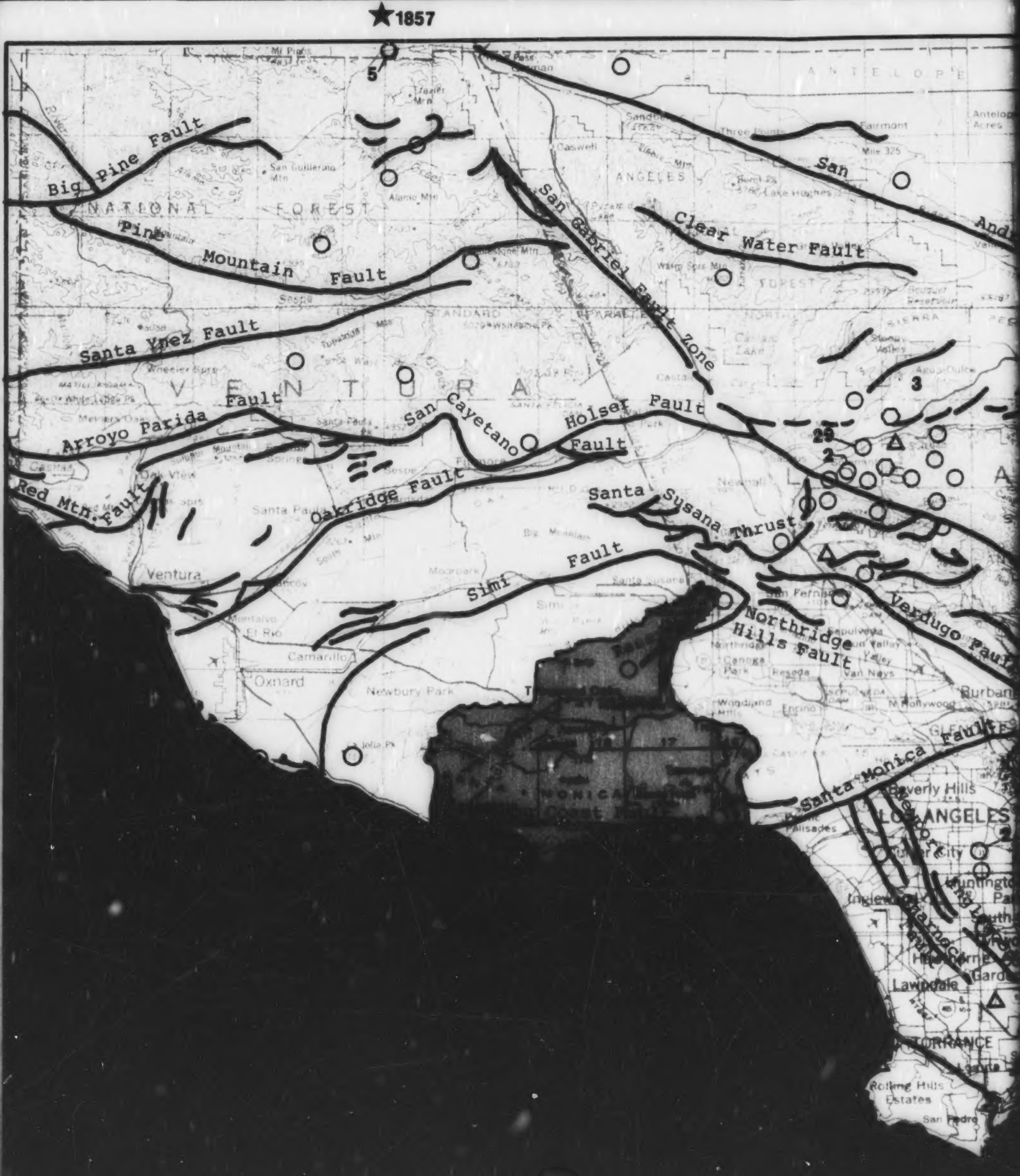
1. C. W. Jennings, 1973, Preliminary Fault and Geologic Map, CDMG Special Report 13, scale 1:750,000.

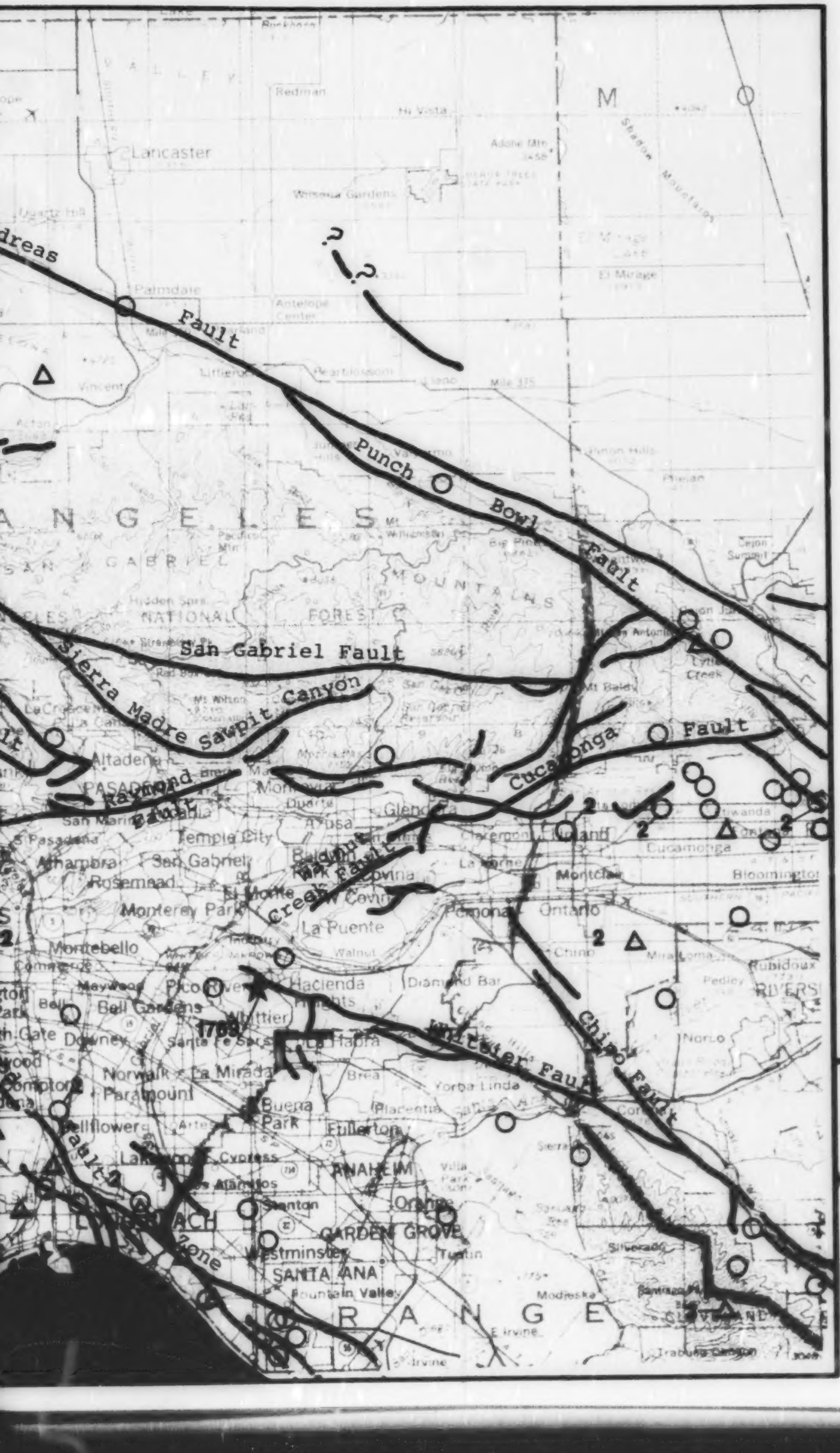
2. J. I. Zionyetal, 1974, Preliminary Map showing Recency of Faulting in Southern California, U.S.G.S. Misc. Field Map NF-585.

Epicenters from:

1. California Department of Water Resources, 1964, Crustal Strain and Fault Movement Investigation, instrumentally determined epicenters (m-4) from 1934-1964 plus large magnitude quakes from 1769-1934, DWR Bull No. 116-2.

2. California Division of Mines and Geology, 1972, Preliminary Earthquake Epicenter, Map of California; CDMG Seismic Safety Information 72-3. (All events M-4-1934-1971, selected historic earthquakes)


★1857
5
Big Pine Fault
Pine Mountain Fault
Santa Ynez Fault
Arroyo Parida Fault
San Cayetano
Holser Fault
Fault
Red Mtn. Fault
Oakridge Fault
Santa Susana Thrust
Simi Fault
Northridge Hills Fault
Verdugo Faul
Santa Monica Fault
San Gabriel Fault Zone
Clear Water Fault
San Andr
3
29
2
NATIONAL FOREST
ANGELES
VENTURA
ANTELOPE
Ventura
Oxnard
Camarillo
Newbury Park
Moorpark
Santa Paula
Fillmore
Oak View
Simi
Newhall
San Fernando
Canoga Park
Reseda
Van Nuys
Burbank
Beverly Hills
LOS ANGELES
Culver City
Inglewood
Hawthorne
Lawndale
TORRANCE
Rolling Hills Estates
San Pedro
Pacific Palisades
Three Points
Fairmont
Lake Hughes
Castaic Lake



dreas
Fault
Punch Bowl Fault
San Gabriel Fault
Sierra Madre
Sawpit Canyon
Raymond Fault
Cucamonga Fault
Walnut Creek Fault
Whittier Fault
Chino Fault
Fault Zone
1769
M O
Lancaster
Palmdale
Redman
Hi Vista
Quartz Hill
Antelope Center
Littlerock
Pearblossom
Llano
Vincent
Acton
El Mirage
Shadow Mountains
Pinon Hills
Phelan
Cajon Summit
Lytle Creek
Big Pines
A N G E L E S
S A N G A B R I E L
NATIONAL FOREST
MOUNTAINS
Mt Baldy
Mt Wilson
La Crescenta
Altadena
Pasadena
San Marino
S Pasadena
Alhambra
Rosemead
San Gabriel
Temple City
Monrovia
Duarte
Azusa
Glendora
Claremont
Upland
Cucamonga
Bloomington
Montclair
La Verne
Covina
W Covina
Baldwin Park
El Monte
Monterey Park
La Puente
Pomona
Ontario
Chino
Walnut
Montebello
Commerce
Pico Rivera
Whittier
Hacienda Heights
Diamond Bar
Mira Loma
Pedley
Rubidoux
RIVERSI
Norco
Maywood
Bell
Bell Gardens
Downey
Santa Fe Springs
La Habra
Brea
Yorba Linda
Placentia
Fullerton
Buena Park
Norwalk
La Mirada
Paramount
Compton
Bellflower
Lakewood
Cypress
Los Alamitos
Stanton
ANAHEIM
Orange
GARDEN GROVE
Westminster
SANTA ANA
Tustin
Fountain Valley
Corona
Sierra
Silverado
Modjeska
E Irvine
Irvine
Trabuco Canyon
CLEVELAND
R A N G E
2

EIS/EIR
Las Virgenes-Triunfo
Malibu-Topanga
Area Wide Facilities Plan

Magnitude of Earthquake

- ○ 4.0≧M<5.0
- △ 5.0≧M<6.0
- ⬡ 6.0≧M<7.0
- ★ M≧7.0

(presumed location of historic earthquake showing date)

Figure 31

0 2 5 10
Miles
North
Scale

faults & epicenters

2-81-A

Shaking is generally more intense and severe in unconsolidated alluvial deposits, and on rock ridges than on flat, low areas underlain by hard rock. In the study area, the most widespread shaking effect from a possible large earthquake would be landsliding. The area contains numerous landslides which could be reactivated during an earthquake. In addition, some areas are underlain by materials that are susceptible to landsliding, such as the Monterey and Rincon Formations and new slides could develop in them.

The intensity of ground shaking effects is commonly expressed in terms of the Modified Mercalli Intensity Scale. Most of the study area lies in a region which, according to the California Urban Geology Master Plan of 1973, would experience a maximum earthquake shaking intensity of VII to VIII, which would cause moderate damage to low-rise masonry and wood-frame buildings. The extreme western corner of the area lies in a region which would experience a maximum intensity of IX or X, and damage would probably be major with ground cracking, liquefaction and similar effects. Intensities such as these could be caused by a moderate earthquake (magnitude around 7) on a nearby fault such as the Malibu Coast, or by a major earthquake (magnitude around 8) on a distant fault, such as the San Andreas. The following table presents a listing of active and potentially active faults that could be the sources of earthquakes damaging to facilities in the study area. The Alquist-Priolo zone status indicates those faults which have been designated by the California State Geologist as being subject to the requirements of the Alquist-Priolo Geologic Hazard Act. The act requires that a special zone be delineated along those faults which constitute a potential hazard to structures from surface faulting or fault creep. Within the zones, as defined by the State Geologist, all proposed structures for human occupancy and/or proposed real estate developments will require geologic studies and no structures for human occupancy are to be permitted on the trace of an active fault (area within 50 feet of an active fault).

Active and Potentially Active Faults

Fault	Activity Status	Alquist-Priolo Zone Status[1]	Distance from Study Area(Mi)	Maximum Credible Earthquake Richter Magnitude[5]
San Andreas	Active	Zoned	24-50	8.25
Newport-Inglewood	Active	Zoned	12-30	7.0
San Fernando	Active	Zoned	7-34	6.5
Malibu Coast**	Potential	FY '76	0-20	7.5 *
Northridge Hills**	Potential[2]	None	0-26	6.5
Reservoir - CE**	Potential[4]	None	0-18	6.0[6]
Simi	Potential[3]	None	4-23	6.5

Santa Susana	Potential[1]	FY'76	2-25	6.5
Santa Monica	Potential[2]	FY'76	6-26	7.5 *
Raymond Hill	Active[2]	FY'76	27-48	7.5 *
Palos Verdes	Potential[2]	None	17-40	7.0
Oak Ridge	Potential[3]	None	12-30	7.5
San Gabriel	Potential	None	9-32	No data

FY - Fiscal year

* - Considers Malibu Coast, Santa Monica and Raymond Hill faults as one fault.

** - Within study area.

Notes:

1. Hart, Earl, 1974, "Zoning for Surface Fault Hazards in California". California Geology, October 1974.
2. Los Angeles County Seismic Safety Element.
3. Ventura County Seismic Element.
4. Jennings, C. W., 1973, Preliminary Fault and Geologic Map, State of California, California Division of Mines and Geology Preliminary Report 13.
5. Greensfelder, Roger W., 1974, Maximum Credible Rock Accelerations from Earthquakes in California. CDMG Map Sheet 23, scale 1:2,500,000.
6. Wentworth, Bonilla, and Buchanan, 1973. Seismic Environment of Burro Flats, Ventura County, California. USGS open-file report.

Facilities in the study area should be designed to withstand probable earthquakes without catastrophic failure. Areas of high landslide potential should be avoided where possible. Detrimental ground shaking effects on septic tank filter fields and on spray irrigation fields include the loss of soil permeability due to the compaction following liquefaction or settlement, and the rupture of lines or other structures due to ground cracking from fault rupture, sliding or lurching.

Low areas along the coast, such as the mouths of the canyons and the beaches, are exposed to the effects of tsunamis. These waves can reach heights of tens of feet and produce heavy damage to moored boats and shore facilities, especially from swift, reversing currents. Drain or spray irrigation fields located in shore areas would be damaged by tsunamis. The only positive means of protection is to avoid areas subject to tsunamis.

2.2.7 Soils

Bedrock complexity combined with wide variation in slope and exposure has created a complex pattern of soil types in the western Santa Monica Mountains, Simi Hills, and interior and coastal lowlands. Over thirty soil series have been mapped in both the Los Angeles and Ventura County portions of the study area by the Soil Conservation Service. (Refer to Soils Map, Figure 32). In addition, interpretations for farm and non-farm purposes supplement basic soils data. The Soil Conservation Service classifies the soil according to a system that includes characteristics such as distribution of particle sizes, slope gradient, parent material, depth, etc. The limiting depth for their classification is 5 feet or depth to bedrock. Consequently, interpretation of soil suitability for various purposes is limited to that depth.

Most of the study area is mantled by clayey soils derived from volcanic and fine grained sedimentary rocks. These soils are typically shallow, expansive, and have limited permeability. Many of the mountainous portions of the study area are devoid of soil; slopes are either too steep to allow formation of soil or, as is the case of badlands areas in the Simi Hills, erosion has stripped the soil away.

Clayey soils are also characteristic of the inland valleys such as Russell Valley (Westlake) and Lindero Canyon. These soils have been derived from slopewash from the surrounding shaley sedimentary terrain and from lacustrine clays believed to have been deposited during a wetter climatic cycle. They are typically highly expansive and impermeable.

In contrast to inland valleys and mountains, soils in the coastal valleys and terraces of the Malibu - Las Virgenes area are coarser grained with smaller clay fractions. Soils here are more permeable and deeper, reflecting their development on gentler slopes.

Soil Capabilities

Most of the soils in the area have limitations for uses such as spray irrigation of effluent, septic tanks, filter fields, agriculture, foundations, etc. Limitations vary throughout the area from slight to severe, depending upon intended use. Appropriate

The Las Virgenes Municipal Water District is presently disposing of approximately 10 percent (400,000 gpd) of the reclaimed water from the Tapia Water Reclamation Facility by selling it for irrigation purposes. The remainder is disposed of by waste spraying on privately owned discharge sites along Las Virgenes Valley and by discharge into Malibu Creek during and immediately after storm periods. No reliable, comprehensive data are available on infiltration rates and capacity of the soils being spray irrigated, nor about acreage being irrigated. The systems are run on an irregular schedule, mainly in the summer. Spray irrigation is stopped when the soils are determined visually to be saturated. Planning of land purchases for future spray irrigation fields is based on the empirical assumption that 100 acres of adequately flat and close-by land are required to dispose of 1 million gallons of effluent per day. Field investigation and testing will be required to determine the actual infiltration rates and capacity of suitabile soils, to estimate required land area, and to design the irrigation systems.

The Appendix presents a listing and description of the soil series which occur in the study area. In addition, it includes an interpretation of their properties relevant to the study.

Soil Data Sources

Data on soil units, distribution, and properties were obtained from the Soil Conservation Service, U. S. Department of Agriculture. Three reports, the Ventura area, Los Angeles County (General Report), and the Malibu area Soil Surveys, were available for consultation. Mapped soil series were transferred to the topographic base by direct overlay drafting and use of a Saltzmann Projector. Small areas along the northeastern fringes of the study area were not covered in detail by these reports. Preliminary information, subject to change upon final correlation, on soils from those areas was obtained by hand-transferring mapped soil series from aerial photographs at an approximate scale of 1 inch equals 2000 feet to the topographic base map.

No soil data at up-to-date standards exist for a small portion of Topanga Canyon located about 3 miles from the coast and for a very small area about 1½ miles east of Silvia Park in the easternmost part of the study area.

Soil series names and mapped contacts do not always coincide along the boundaries of adjacent data sources. This is a consequence of changes in definitions and nomenclature by the Soil Conservation Service. The compilation presented in this report shows soil series as originally mapped by the Soil Conservation Service; no field mapping or checking was performed during this study to eliminate discrepancies, since the Soil Conservation Service is planning to resolve them in the near future.

investigations and testing, as well as careful design and management, are required for successful implementation of most uses. The designation of soil limitations for certain uses are a warning that problems may develop especially if the soils are overtaxed, and the soils will not sustain the use for long periods of time.

The Area Wide Facilities Plan considers alternatives for effluent disposal by spray irrigation and also considers septic tank and filter fields to handle sewage. Maps showing soil limitations for spray irrigation and for septic tank and filter fields were prepared based on criteria developed by the Soil Conservation Service (Figures 33 and 34).

Septic tanks and filter fields constitute a common method of sewage disposal in the coastal portion of the study area. Septic tank systems will function well only if the appropriate geologic, hydrologic and soil conditions exist. The extent of areas needed for individual systems is governed by local codes. Systems are successful if environmental constraints such as population density, hydrologic regime, soil infiltration, and transmissibility capacity remain favorable. Systems fail due to many reasons, such as improper physical location, deficient design or construction, saturation of leach line system or seepage pit, and overloading. Areas that are generally suitable for septic tanks and filter fields are scarce in the study area. They have been identified on the suitability map. Areas shown as having severe limitations are not always totally unsuitable, however. Individual sites may be suitable if all conditions are favorable for a particular system. Therefore, the categorization of limitations is a general guide and will not replace site-by-site analysis.

The efficiency of an effluent disposal system based on spray irrigation is dependent on the inherent ability of a soil to absorb and transmit water. Soils best suited for this purpose are those that correspond generally to Class I and II soils, according to the agricultural capability classification. These soils have gentle slopes, high infiltration and transmission rates, low erosion potential, and are thick. This type of soil exists in valleys and other flat areas. In the study area, suitable soils for spray irrigation disposal of effluent occur in Hidden Valley, Las Virgenes Valley, various terraces and canyons along the Malibu Coast, such as the mouth of Malibu Canyon, and the seaward portion of Point Dume; in addition, the flat area known as Laskey Mesa is appropriate for this purpose. Other smaller areas are distributed throughout the area as well.

SOILS MAP LEGEND FOR FIGURE 32

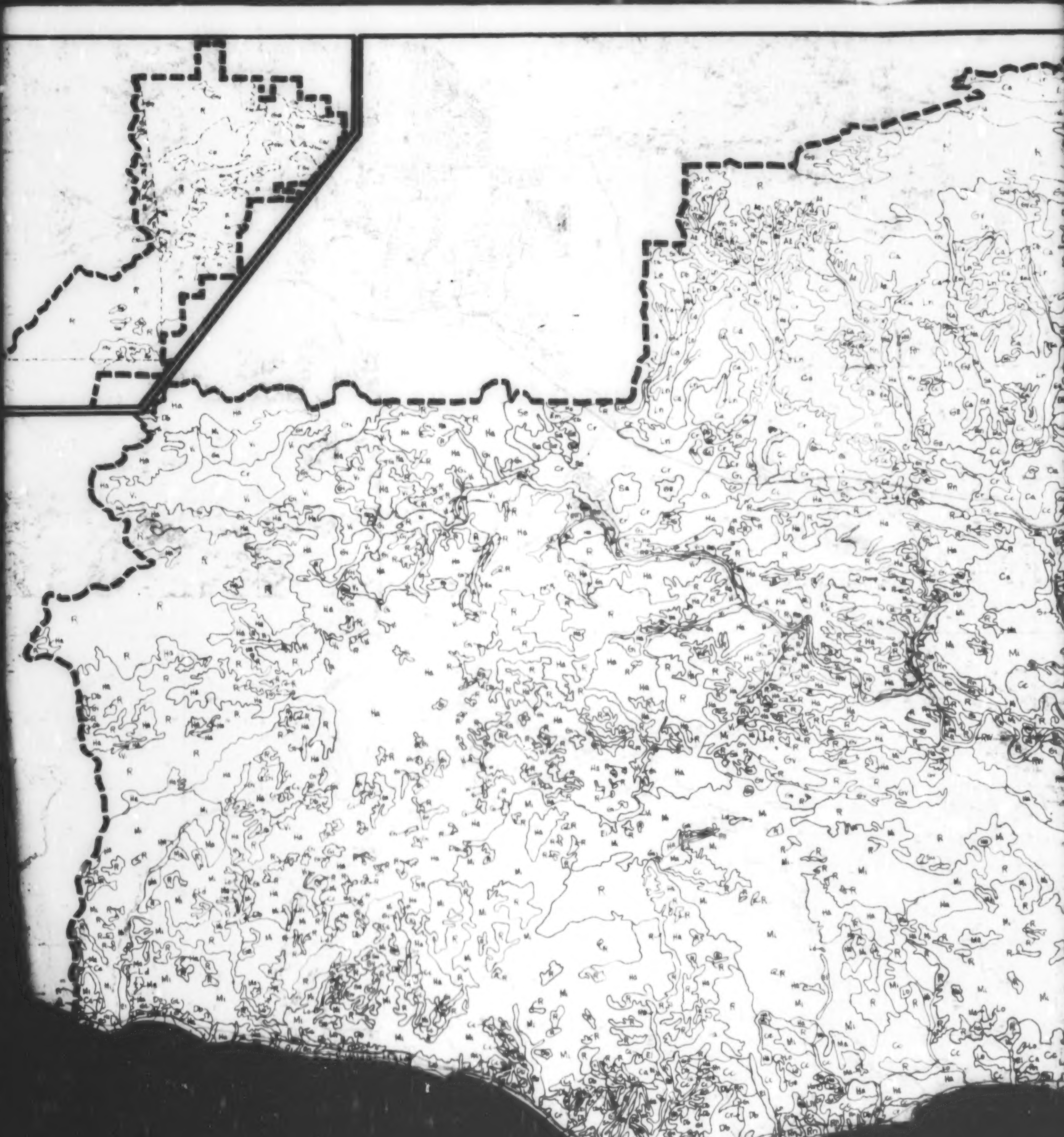
AN	Anacapa sandy loam
AZ	Azule loam
BA	Balcom silty clay loam
CA	Calleguas shaly loam
CC	Castaic silty clay
CH	Chualar sandy clay loam
CI	Cibo clay
CB	Coastal beach (sand)
CP	Conejo silty clay loam
CO	Corralitos sandy loam
CR	Cropley clay
DB	Diablo clay
Dump	Sanitary land fill dumps & rock & gravel pits
EL	Elder sandy loam
FL	Fill land, loamy
GA	Garretson loam
GV	Gaviota rocky sandy loam
GZ	Gazos silty clay loam
GI	Gilroy clay loam
GL	Gullied land/badlands
HU	Huerhuero fine sandy loam
LN	Linne silty clay loam
LD	Lockwood loam
LO	Los Osos clay loam
MA	Malibu loam
MI	Millsholm loam
MO	Mocho loam
NA	Nacimiento silty clay loam
PA	Palisades loam
RN	Rincon silty clay loam
RW	Riverwash/sandy alluvial land
R	Rockland
SA	Salinas clay loam
SB	San Andreas sandy loam
SC	San Benito clay loam
SE	Santa Lucia shaly silty clay loam
SU	Saugus sandy loam
SV	Soper loam
SO	Sorrento loam
VI	Vina loam
YO	Yolo silty loam
ZM	Zamora loam

MAP SOURCES

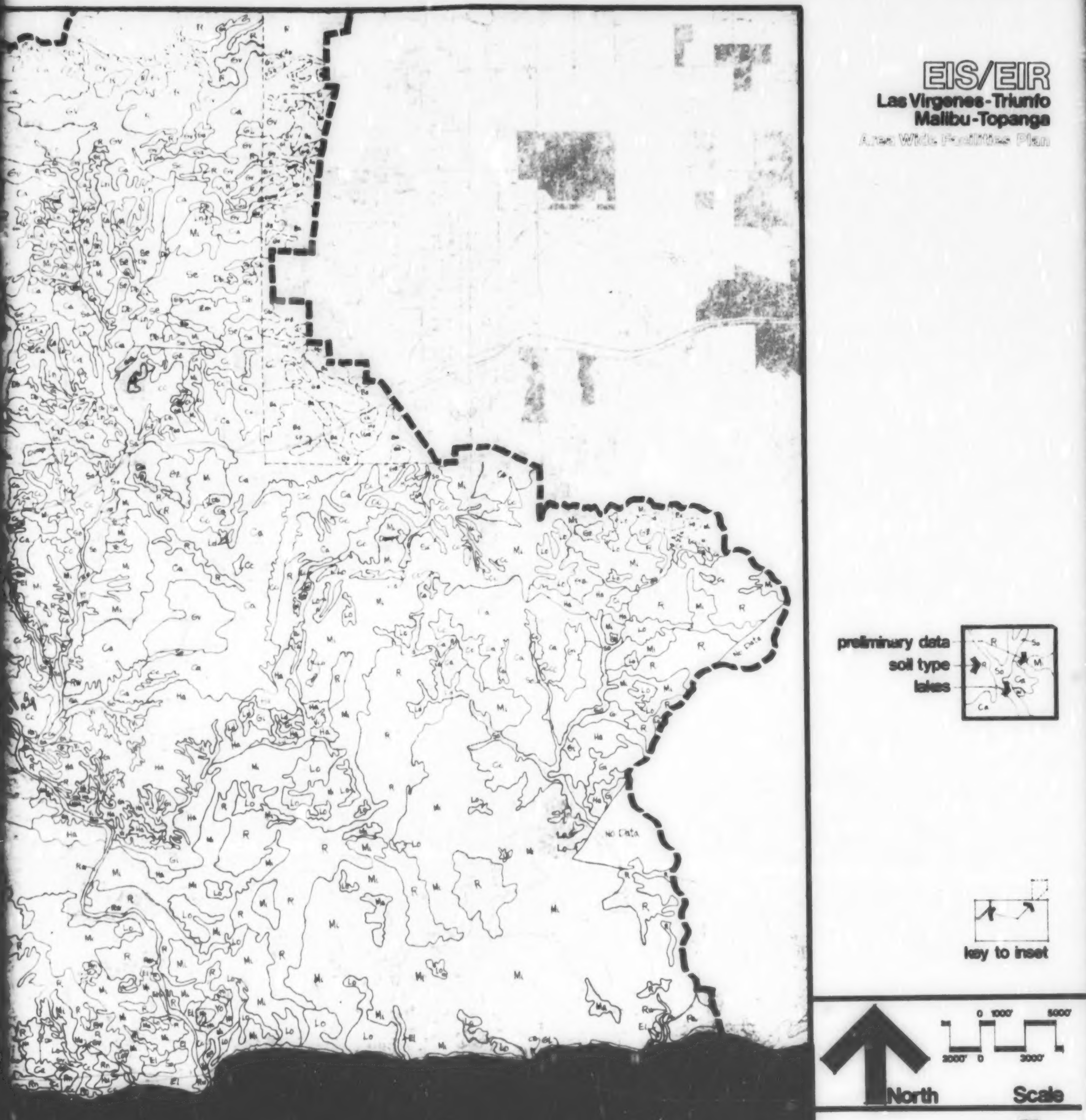
Soil Conservation Service, 1967, Soil Survey of the Malibu Area.

Soil Conservation Service, 1970, Soil Survey of the Ventura Area.

Soil Conservation Service, in progress, Soil Survey of West San Fernando Valley.



EIS/EIR
Las Virgenes-Triunfo
Malibu-Topanga
Area Wide Facilities Plan

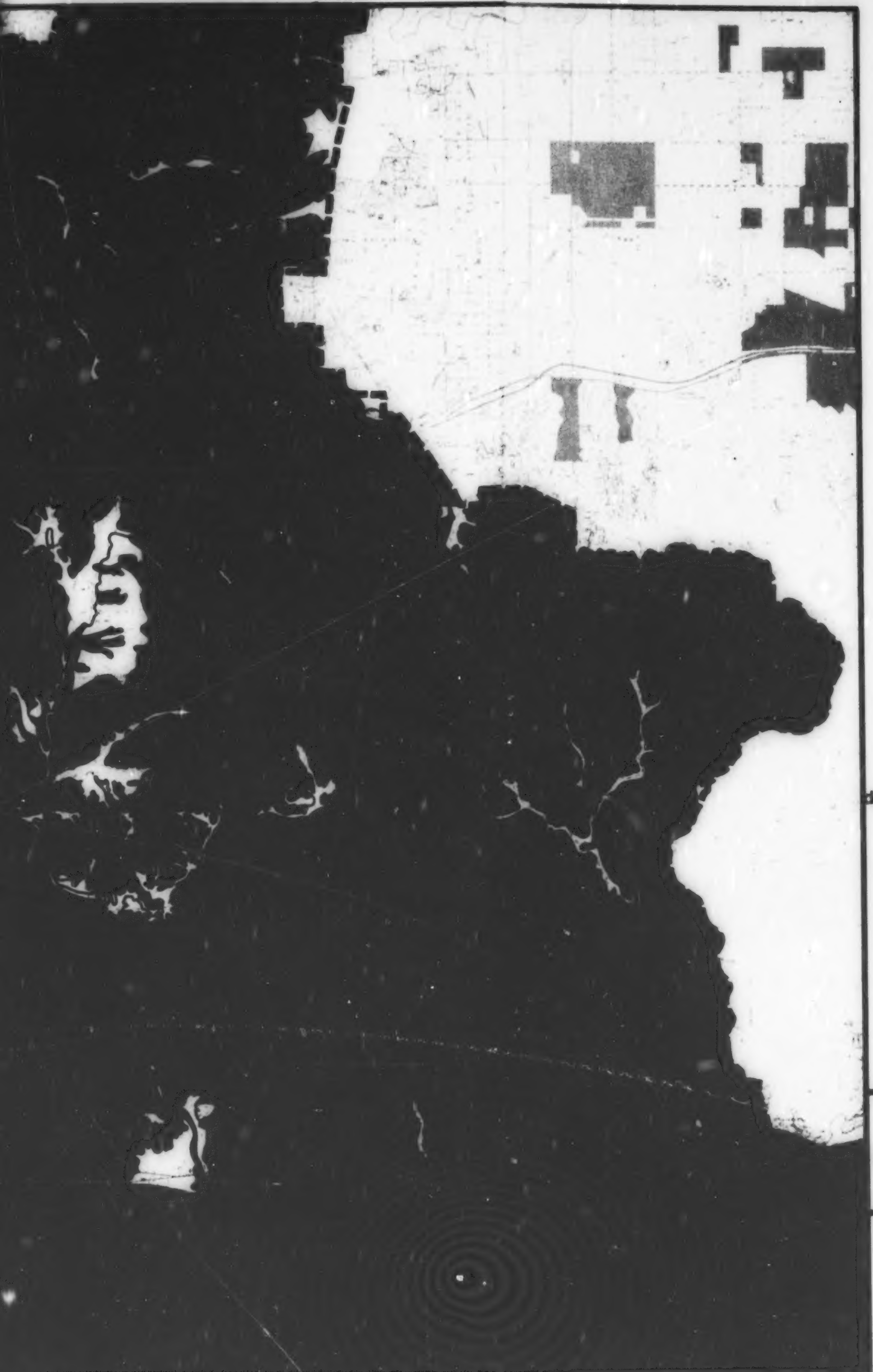

No Data
No Data
preliminary data
soil type
lakes
key to inset
North
0
1000'
5000'
2000'
0
3000'
Scale

soils

fig. 32

2-87-A

EIS/EIR
Las Virgenes-Triunfo
Malibu-Topanga
Area Wide Facilities Plan


degree of suitability:
very good
good
marginal
poor
key to inset
North
Scale
0 1000' 5000'
2000' 0 3000'

spray irrigation suitability

fig.33

2-87-B

EIS/EIR
Las Virgenes-Triunfo
Malibu-Topanga
Area Wide Facilities Plan

degree of limitation:
severe
moderate
slight
key to inset
0
1000'
3000'
2000'
0
3000'
North
Scale

drain field suitability

fig. 34

2.2.8 Biota

The Study Area possesses a diverse topography that includes coastline, flatlands, and mountains. The geographical diversity provides a wide variety of physical environments which has produced a very unique and diverse collection of biological resources, including several biotic communities.

Most of the coastal biotic resources in the Study Area have been considerably modified since 1900 by pollution, development and intense recreational use. These activities are continuing to reduce habitat areas, and are threatening to eliminate several species and unique communities. Until a few years ago, development inland, particularly in the Santa Monica Mountains, was isolated and relatively small in size. However, development has recently accelerated, and several of these communities are becoming more limited in distribution.

Biotic Communities

Biotic communities are assemblages of plant and animal species that are found in specific physical habitats. They are ecological units containing a diverse group of organisms that exist together in an orderly predictable manner and have a very close and complex set of interrelationships. These communities are commonly identified and discussed with reference to one or two dominant plant species and the nature of the vegetation.

According to the Munz (1974) classification of biotic communities, seven communities can be found in the Study Area. However, this number does not fully reflect the diversity found there. The Munzian system only identifies major vegetation, and does not take into account variations within communities. More recently, a system proposed by Cheatham and Haller (1975) deals well with this parameter. Based on their system, no less than twenty habitat-types are found within the Study Area. Several other classifications exist that fall somewhere in between these.

Following is a brief description of the biotic communities found in the Study Area. Biological resources will be discussed in greater detail in addendums to this study as reports on individual project sites are prepared. Community descriptions are based on several sources and are intended to be general as is appropriate for this report. Due to the large Study Area, only major communities are discussed according to a classification system similar to Munz (1974).

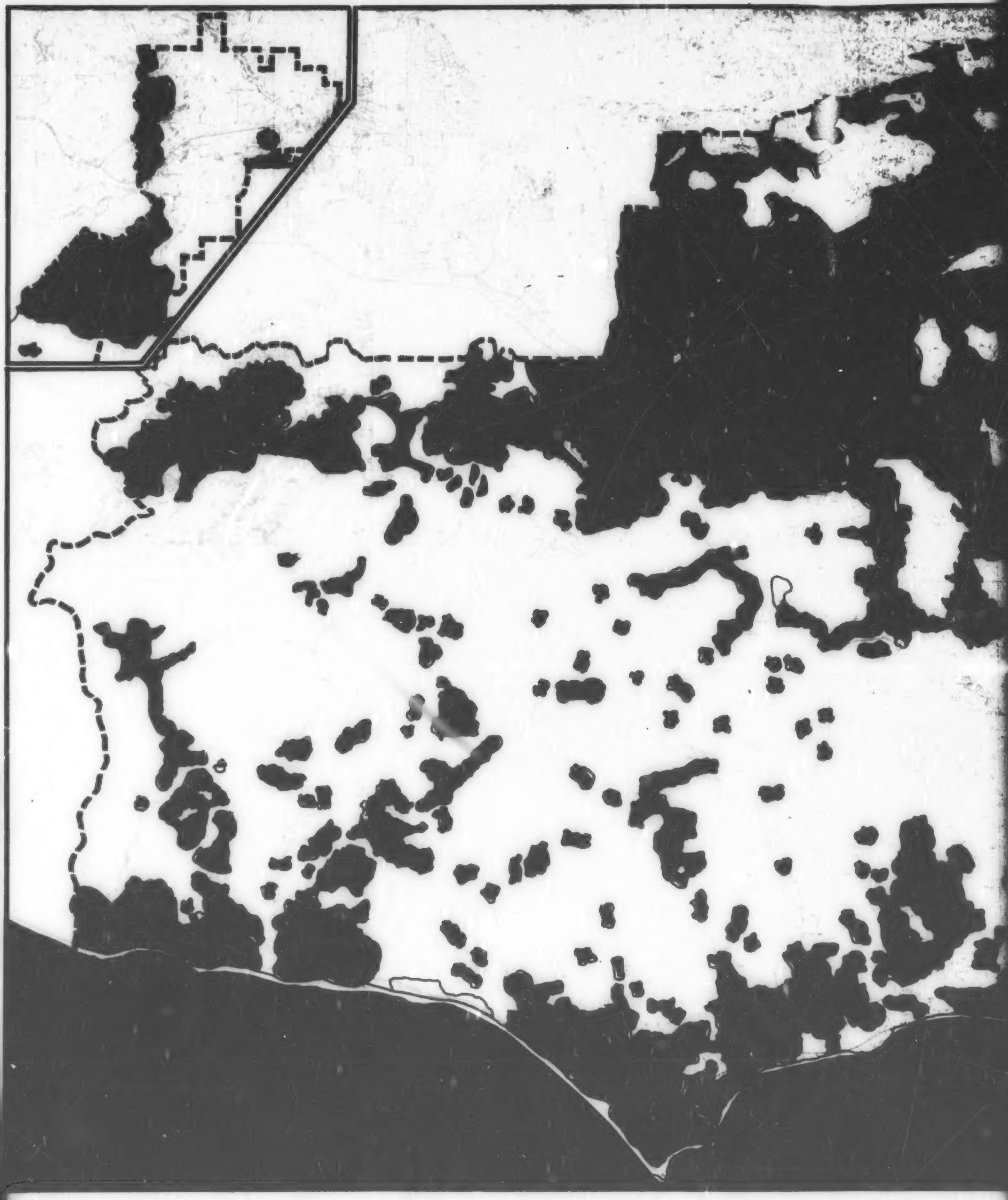
Each description includes general information on the significance, physiognomy, characteristic plant species, representative animals, distribution, and wildlife value, as well as brief descriptions of any sub-communities. More detailed lists of the common plant and animal species found in each community is included in the Appendix.

A map of biotic communities (Fig. 35) was prepared using existing color infrared and LANDSAT Satellite imagery interpretation, and electrostatic vegetation maps prepared as part of the 1976 Los Angeles County Land Capability/Suitability Study. These sources provided the most up-to-date information available, however, they are preliminary and are subject to change. The distribution of communities is highly generalized, with a limited number of community categories, and is not intended to be used to discuss individual project sites.

Coastal Salt Marsh Lagoon

A relatively small estuary occurs at the mouth of Malibu Creek that is in part surrounded by about four hectares of poorly developed coastal salt marsh. However, the potential for a more extensive and higher quality development of this community does exist. This habitat was once commonly found at the mouths of coastal rivers and streams in California. At one time, coastal salt marsh covered approximately 2700 hectares in Los Angeles County. However, due to airport, marina, recreational, residential, and industrial developments, this acreage has been severely reduced. Only 4% of those areas remain today, and portions of these are slated for development. In addition, remaining estuarine and salt marsh habitats have been heavily impacted by man's activities. This is especially true at the Malibu Creek outfall where urban development abuts the habitat and there is uncontrolled access.

Characteristically, estuaries are semi-enclosed bodies of water along coastlines. They have a free connection with the open ocean, and are thus strongly affected by tidal action. However, within an estuary sea water mixes with fresh water from land drainage and is measurably diluted. Physical conditions are often very stressful and exhibit wide ranges in salinity and temperature. Species inhabiting estuaries show wide tolerances to these conditions. In addition, plant species growing in this habitat must endure water-saturated, oxygen poor soils. For these reasons, the diversity of resident species in this habitat is correspondingly low. The organisms found there include a mixture of



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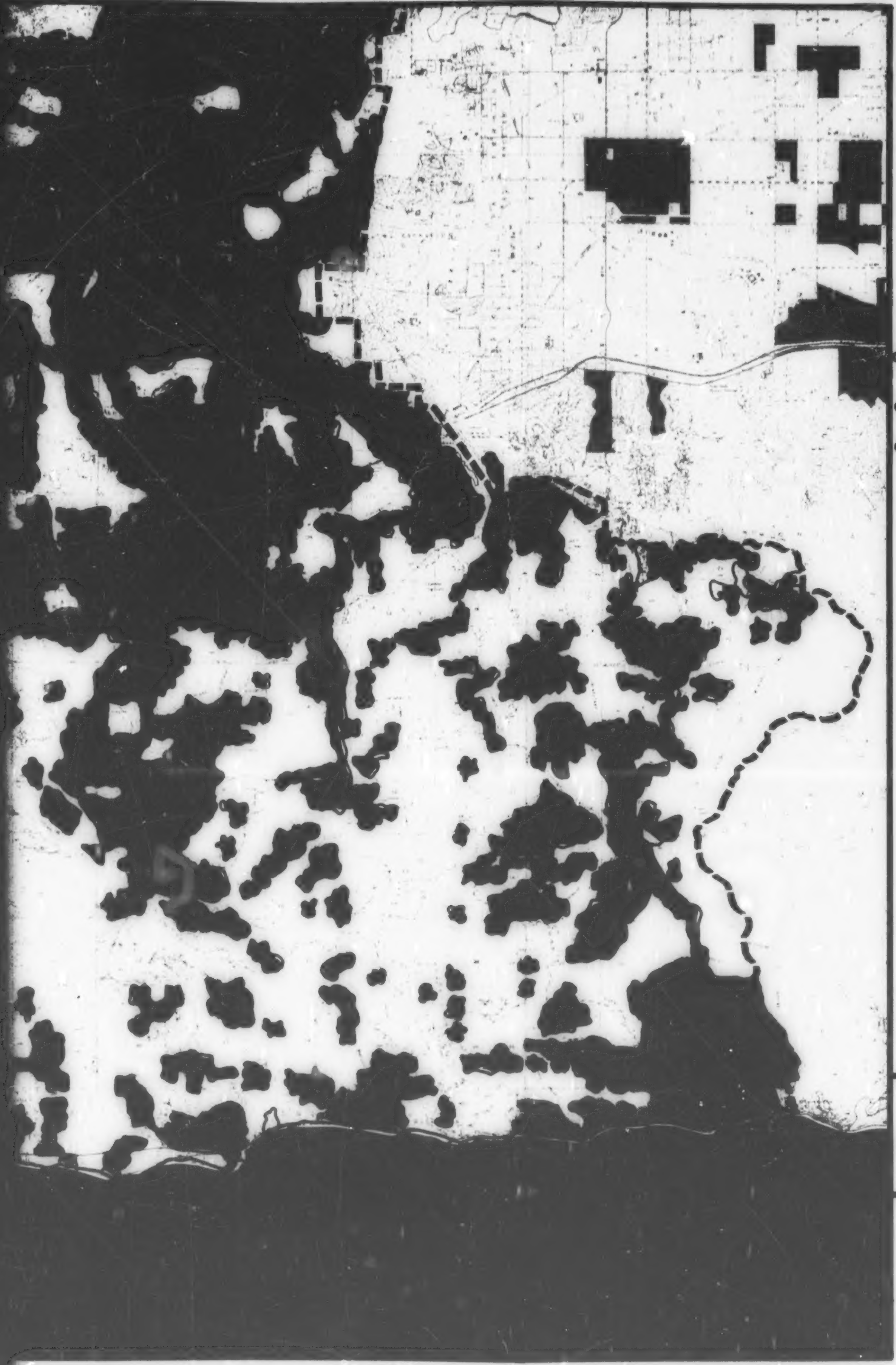
Malibu-Topanga
Area Wide Facilities Plan


chaparral
riparian
herbland
woodland
urban
sandy inter-tidal
coastal dune scrub
rocky inter-tidal
coastal salt marsh/ lagoon
coastal sage scrub
key to inset
North
0
1000'
5000'
2000'
0
3000'
Scale

biota

fig. 35

2-89-A

endemic species and those which come from the marine environment, plus a very limited number which possess the physiological capabilites to enter from the freshwater environment. However, estuaries tend to be much more productive than the marine and freshwater environments on either side, and they serve as important food sources to a great number of organisms. The reasons for this high productivity are that estuaries act as nutrient traps, they possess a variety of primary producers capable of year-round photosynthesis, and they benefit from a fluctuating water-level ecosystem which acts to remove wastes and transport food and nutrients.

The mouth of Malibu Creek possesses an estuary situation where a lagoon will periodically form behind a sand bar separating the ocean and the creek mouth. The lagoon is constantly filled by the perennial creek. Periodically the stream inflow will raise the level of the lagoon to a point where it will overflow. The draining water quickly erodes the sand barrier at the mouth and the lagoon empites in a few hours. However, wave action will close the opening, and the lagoon will reform. During periods of lagoon closure, the water may become stagnant. Under these conditions, the mouth is often artificially opened as a public health and safety measure.

The vegetation of coastal salt marshes is typically dominated by low growing grasses and succulents which are adapted to high soil salinities. The dominant plant species found at the Malibu Lagoon marsh include pickleweed (Salicornia sp.), sea blite (Suaeda californica), and saltgrass (Distichlis spicata). Several other halophytic (plants that grow in saline soils) species are common.

The amphibian, reptilian, and mammalian faunas of the lagoon are considerably limited. However, the area is an important bird refuge, providing resting and feeding grounds for over 200 species of resident and migratory birds.

Sandy Intertidal

This habitat is common along the coastline of Southern California. In the Study Area, it generally occurs in long stretches intermittent with shorter stretches of rocky shoreline. Most of the coastline receives heavy recreational use, but this has not seriously degraded the habitat here. The coastline here possesses the only complete relatively healthy sandy intertidal communities remaining in Los Angeles County.

Sandy beaches are very dynamic in physical stability and accrete or erode on a seasonal basis. This natural instability is unfavorable for the development of a diverse biological community and high biomass, particularly when compared to other coastline communities. Sedentary organisms are either buried or are eroded away. However, sandy intertidal areas do provide habitat for a variety of mobile and microscopic forms. An important micro-community of decomposers is present, as well as many species of invertebrate mega-fauna. Sandy beaches also provide feeding areas for many shorebirds specifically adapted for feeding on burrowing invertebrates. In addition, the soft substrate offers a repository for eggs and a nursery ground for many species.

High in the intertidal zone relatively small organisms are found including beach hoppers, rock runners, kelp flies, sand crabs, and bean clams. Below the surf zone, larger organisms are found including sand dollars, hermit crabs, burrowing worms, snails, starfish, and fish.

Rocky Intertidal

Rocky intertidal communities are found at several localities along the Malibu coastline including cobble beds found at the mouth of some of the tributary streams, shale reefs, and igneous rock outcrops. These areas offer a tremendous variety of niches available to organisms. As a result of the stability of the substrate, an increase in surface area, and the variation in the form and orientation of the area, the biotic diversity can increase by many orders of magnitude over that found in other coastline habitats. Variations in biota between rocky intertidal areas may also occur due to differences in the type of rock, its location and exposure, the size of rock, and the adjacent type of shoreline.

The distribution of plants and animals in these communities usually follows a vertical zonation pattern. Each zone possesses many niches available to many species, each selectively adapted to a particular degree of exposure to salt water or to air. While some organisms are restricted to a very narrow niche, others range through the full extent of the tidal zone and are capable of tolerating long periods of exposure or submergence.

The species inhabiting the high tidal areas are largely mobile scavengers which feed upon materials deposited on the shore during high tides. A few more sedentary organisms are also present including diatoms, periwinkles, limpets, and barnacles. The variety of species increases significantly in the mid-tidal zone where snails, mussels, chitons, sea anemones, algae, and worms are found. The biota continues to increase in abundance and complexity in the lower intertidal zone. Marine life includes a greater variety of the same types found in higher zones as well as several species of algae and surf grass. The narrow span from the lower intertidal area to a depth of about 100 feet can be the most biologically active region of all marine, terrestrial, and aquatic habitats. No other type of habitat supports the quantity and diversity of life equal to these areas.

Kelp beds enhance the natural fertility and productivity of these communities at several locations within the Study Area. Kelp beds were once common along the Southern California coastline wherever rocks are present at shallow depths (0-30 meters). However, their distribution has declined in recent years, possibly as the result of a combination of natural phenomena and decreased water quality.

Kelp beds serve several important functions. They have a breaking influence on wave surges and thus act as a stabilizing factor to lessen the erosion of the shoreline. They also serve as important nursery grounds, food, and cover, for a tremendous diversity of organisms. In terms of overall values to the biota of the local inshore waters, kelp beds may account for a minimum of 90% of the biomass of those areas.

Coastal Dune Scrub

This is a narrow community found in scattered localities in the dunes and upper sandy beaches along much of the California coastline. The sandy beach community is normally found below this habitat. Away from the coast this community intergrades with coastal sage scrub.

Despite many favorable environmental conditions, including a year-round frost free growing season, moderate temperatures, and high humidity, this is a harsh habitat for the relatively few species adapted to it. The substrate is sandy and loose, and there is strong and persistent wind. In addition, there is chronic fog and constant exposure to sea salt.

The vegetation is usually sparce and characterized by rhizomatus grasses, sprawling succulents, and soft-woody, more or less evergreen shrubs less than one meter tall. The species composition of this community varies considerably from north to south; however, there are a few species whose distributions include most areas of this habitat. Common plants of this community include sandverbena (*Abronia* sp.), salt-bush (*Atriplex* sp., iceplant (*Gasoul* sp.), Lupine (*Lupinus* sp.), and morning glory (*Calystegia* sp.).

The vertebrate fauna of this community is not usually diverse or abundant. The most common animals seen are bird species associated with the marine environment. These include several species of gulls, sandpipers, and plovers.

As beachfront development has taken place along the coastline, the amount of coastal dune scrub community has been greatly reduced. In addition, beaches have received intense human use and very few areas of undisturbed habitat remain. Point Dume possesses the only examples of this community in the Study Area.

Recent development has reduced the extent of this particular community, but the remaining habitat is reported to be stabilized.

Coastal Sage Scrub

Coastal sage scrub is the characteristic plant community of the lower elevation hillsides and ridges of coastal and cismontane Southern California. Within the Study Area this community is generally found below 1000 feet where it is present as a band surrounding higher mountains and extending into these mountains in the larger canyons.

This community has been continually removed by man for agricultural and urban expansion, and is rapidly decreasing in availability, especially in Los Angeles County. In 1963, the California Department of Fish and Game estimated that it covered only 6.8% of the County. This has been considerably reduced since then, and, in addition to these removals, many remaining habitat areas have been heavily impacted by grazing. This is particularly true of the Study Area. However, many areas of good to excellent coastal sage scrub habitat can be found.

Coastal sage scrub is an open shrub community. The dominant species are shrubs that grow 0.3 to 1.5 meters high, but do not normally form a closed canopy. However, bare ground is not common. Rainfall and soil moisture are sufficient to support a rich variety of forbs and grasses. The composition of this community varies considerably within the Study Area and three sub-communities can be identified. This is the result of the great diversity in climate, soils, and topography found among the coastal, montane and cismontane environments present.

Where this community occurs on ocean cliffs, it is commonly termed a seabluff succulent community. This is an uncommon vegetative association composed of endemic shrubs and succulent herbs which differs greatly from inland coastal sage scrub. Within the Study Area, it is found at scattered localities on the coastal bluffs of the Malibu Coast. Another form of coastal sage scrub, maritime sage scrub, is found covering the hilltops and slopes of the immediate coast. This sub-community is more diverse than the seabluff succulent due to a more favorable environment, and it contains many shrubs and herbs. The most familiar sub-community occurring within the Study Area is the inland sage scrub. It is generally found at higher elevations than either seabluff succulent or maritime sage. Where it occurs further inland, the hotter and drier climate results in a reduced species diversity.

Floral species commonly comprising coastal sage scrub communities include California sagebrush (*Artemisia californica*), California encelia (*Encelia californica*), deer weed (*Lotus scoparius*), black sage (*Salvia mellifera*), and California buckwheat (*Eriogonum fasciculatum*). Larger shrubs such as lemonadeberry (*Rhus integrifolia*), laurel sumac (*Rhus laurina*), and toyon (*Heteromeles arbutifolia*) are also common on north-facing slopes and in drainages. Common groundcover species are annual grasses and forbs introduced by man through grazing and agriculture. These include black mustard (*Brassica nigra*), red-stemmed filaree (*Erodium cicutarium*), foxtail chess (*Bromus rubens*), soft chess (*Bromus mollis*), and wild oat (*Avena fatua*).

Coastal sage scrub supports a wide diversity of wildlife. Large, wide ranging mammals such as mule deer, bobcat, and coyote utilize this community within their range. Small rodents such as the deer mouse, pacific kangaroo rat, Beechey ground squirrel, and Bottae pocket gopher are usually common, as are the black-tailed hare, and Audubon's cottontail. Several snake and lizard species can be found; however, amphibians are generally absent. Characteristic bird species include the brown towhee, several sparrow species, California thrasher, blue-gray gnatcatcher, and roadrunner. Other small migratory birds become common in the winter and wide-ranging predatory birds are frequently seen overhead. These raptors roost in nearby riparian woodland, and on cliffs and rocks.

Chapparal

This community occurs on the study site at upper elevations and in moist shaded areas. Chapparal is widely distributed throughout California on dry slopes and ridges at low and medium elevations where it occupies thin, rocky, or heavy soils. It is typically a broad-leaf, sclerophyllous vegetation; however, species composition varies considerably. Chapparal species commonly grow 2.0 to 3.5 meters high and often form dense nearly impenetrable stands. The vegetation in many areas within the Study Area is much more open at the current time because of recent fires. However, given time, they will regenerate to dense shrub covers.

Lower elevations along the southern slopes of the Transverse Ranges support mixed chaparral sub-communities. They are composed of a high diversity of thick-leaved shrubs and many herbs in the more open stands. Chamisal is the name given to a second sub-community composed almost exclusively of chamise Adenostoma fasciculatum), the indicator species for chaparral. Another chaparral species known as red-shanks, or ribbon bush (Adenostoma sparsifolium), similarly forms nearly pure stands of tall, distinctive shrubbery. The red-shanks sub-community is more common in the Peninsular Ranges of southern and Baja California but does occur in the Study Area at scattered limited localities.

Chaparral communities are usually dominated by chamise. Other common species include Eastwood's manzanita (arctostaphylos glandulosa), big-podded ceanothus (Ceanothus megacarpus), green barked ceanothus (Ceanothus spinosus), mountain mahogany (Cercocarpus betuloides), and toyon (Heteromeles arbutifolia). For several years following a fire, there are a number of forbs and grasses that are present. However, these will become less abundant as the shrubs regenerate and form a closed canopy.

Fire plays an important role in the ecology of chaparral. The plants of this community have become adapted to recurrent fires and either produce seeds that require high temperatures before germinating or possess root crowns that send up sprouts following fire. If fire does not occur, plants eventually become senile and die without replacement. This can lead to problems in wildlife and watershed management. Following a fire, annuals produce a dense groundcover that holds the soil in place until the larger shrubs are reestablished.

The diversity of wildlife in pure unbroken stands of chaparral is limited. They are relatively low in plant diversity and do not support an abundance of animal species. However, community productivity is high and large numbers of individuals of each species are often present. Under natural conditions of recurring fire, the chaparral is regularly burned, thus creating openings that often support many grasses and coastal sage scrub species. This process is extremely important to wildlife. These openings provide an edge between the successional vegetation and chaparral that is much more diverse and able to support a greater number of species than either community alone. These animals are able to utilize this interface as an entrance to dense chaparral in areas that would otherwise be closed to them. The characteristic species found in this plant community are virtually the same as those found in coastal sage scrub.

Riparian Woodland

Riparian communities are found along stream courses throughout California where moisture is at or near the surface on a year-round basis. This vegetation type is found along many of the major stream courses in the Study Area. The most common dominant of this community is western sycamore (*Platanus race-mosa*). Other very common species include coast live oak (*Quercus agrifolia*), willow (*Salix* sp.), and mule fat (*Baccharis glutinosa*). An understory of shrubs is commonly present but groundcover is generally a thick layer of leaf litter.

The riparian community is becoming extremely uncommon in Southern California. In 1963, the California Department of Fish and Game estimated that only 1.4% of Los Angeles County supported this habitat. This figure has been seriously reduced since then by urban and agricultural expansion, especially flood control and irrigation projects. This trend is very critical because riparian vegetation is highly valuable as wildlife habitat. It possesses a high diversity of plant types that in turn support a large number of animal species. Amphibian populations are relatively abundant beneath the moist leaf litter and along stream banks. Most of the reptiles found in surrounding habitats can also be found here in addition to several species restricted to moist riparian vegetation including southern alligator lizard, western pond turtle where pools of water occur, and several species of snakes. Small mammals including woodrats, deer mice, harvest mice, gophers, and shrews occur along the borders of neighboring vegetation types and in areas where seasonal flooding does not occur. This habitat is also important to medium and large mammals. Coyote, gray fox, mule deer, bobcat, badger, and skunks commonly use the habitat for food and cover. Virginia opossum and raccoon spend much of their time here.

Riparian habitat is very important to bird species. Nearly all the species found in surrounding habitats can be found here. In addition, it supports others that require the moist vegetation and/or trees. Hummingbirds, woodpeckers, many flycatchers, thrushes, vireos, warblers, and most finches forage and nest in this habitat. Many of these species are migratory, and utilize this habitat for cover and as a feeding area as they move through in the fall and in the spring. Hawks, owls, falcons, kites, and doves specifically require the trees as perching and nesting sites and forage in surrounding vegetation. Some predatory species such as Cooper's hawk and sharp-shinned hawk forage in the habitat itself. One species, the red-shouldered hawk, is completely confined to riparian and oak woodland situations. Due to destruction of its habitat, this species has been declining in recent years.

Cismontane Introduced Grassland

This vegetation has replaced native grasslands and coastal sage scrub in many low elevation valleys and foothills in cismontane Southern California where it is commonly found in fine textured clay-bearing soils that are water logged during the winter rainy season, and are very dry during the summer and fall. Use for agriculture and grazing has greatly altered the natural vegetation. Native species have either been cleared or destroyed by cattle and have been replaced by adventitious species that can withstand constant disturbance. Within the Study Area, cismontane introduced grassland has been maintained by grazing and cultivation.

The flora of this community is dominated by annual grasses and forbs that grow 0.2 to 1.0 meter high. These commonly include wild oats, ripgut-grass (*Bromus diandrus*), foxtail chess, black mustard, and red-stemmed filaree. These are non-natives and are considered to be "weedy" species. Frequently associated with these are native wildflowers including owl's clover (*Ortho-carpus* sp.), lupine (*Lupinus* sp.), fiddleneck (*Amsinckia inter-media*), and California poppy (*Eschscholzia californica*). The vegetative cover of this community characteristically germinates during the late fall rainfall, and grows and flowers from winter through spring. Plants then die and persist as seeds through summer and fall.

Large open expanses of grassland support a limited abundance and diversity of wildlife. Only one amphibian species is expected in this dry habitat. It is the western spadefoot toad. This species can survive there because of its burrowing behavior and physiological adaptations to conserve body water. Reptiles are represented by several snake species, the coast horned lizard, western fence lizard, side-blotched lizard, and western whiptail lizard.

The mammalian fauna found in this type of habitat is composed of small rodents, Beechey ground squirrel, Botta pocket gopher. Audubon's cottontail, and several other medium to large mammals that forage here. Two groups of birds dominate the avian fauna in this community. Grassland birds such as the western meadowlark, water pipit, savannah sparrow, lark sparrow, and horned lark forage for seeds and insects on the ground. Several of these species will nest here if not disturbed. The second group of birds are the predators. Predatory species that commonly forage in grassland areas include the golden eagle, red-tailed hawk, marsh hawk, white-tailed kite turkey vulture, American Kestrel, great horned owl, barn owl, and screech owl. For these organisms, old fields serve as important feeding grounds. However, they depend on adjoining southern oak woodland habitat for nesting and perching sites.

Oak Woodland

The oak woodland community is found in areas that possess deep moist soils and are protected from fires. Thus, it often occurs in canyon bottoms and on moist north-facing hillsides. It is an extremely uncommon community in Southern California, and was estimated by the California Department of Fish and Game to cover less than .7% of Los Angeles County in 1963. This figure has been considerably reduced since then by agricultural and urban expansion.

This community is found throughout the Study Area at scattered localities. Where this community occurs in the lower interior valleys in the eastern portion of the Study Area, it is referred to as valley oak woodland. This sub-community is typically open, forming a "savanna" rather than a closed canopy woodland. The dominant species in these areas is valley oak (*Quercus lobata*). This species reaches fifteen to thirty meters in height and is one of California's largest broad-leaved trees. Understory species are usually limited to many introduced grasses and forbs commonly found in cismontane introduced grassland. Another type of oak woodland, southern interior oak woodland, is also found in the interior valleys of the Study Area, but it occurs at generally higher elevations. This sub-community is dominated by California walnut (*Juglaus californica*) and coast live oak (*Q. agricolia*). It commonly intergrades with coastal sage scrub or mixed chaparral on drier, rockier soils. A third sub-community is found on the coastal slopes of the Santa Monica Mountains where it is typically restricted to north-facing slopes and shaded ravines. This vegetation type is dominated almost exclusively by coast live oak. However, large shrubs including toyon and elderberry occupy the openings between trees.

Oak woodland is an important wildlife habitat. The added dimension of large trees supports a high diversity of animal life. This is enhanced by its interface with surrounding vegetation types and most species found in adjacent vegetation types can be found here. Amphibian populations are supported beneath the moist leaf litter and along stream banks while reptiles are common in the understory vegetation and ground-cover Many mammals also reside in this habitat. Oak woodland is extremely important to bird species for the same reasons that riparian is, and the faunas are very similar.

Rare, Endangered, Or Threatened Species

Widespread habitat loss and degradation in Southern California is now indicated by the relatively high number of rare, endangered, or threatened plant and animal species found here. Within the Study Area alone, seven animal species including the California condor (*Gymnogyps californianus*), American peregrine falcon (*Falco peregrinus anatum*), southern bald eagle (*Haliaeetus leucocephalus californicus*), California brown pelican (*Pelecanus occidentialis californicus*), California least tern (*Sterna albifrons browni*), light-footed clapper rail (*Rallus longirostris levipes*), and Belding's savannah sparrow (*Passerculus sandwichenis beldingi*), and three plant species including the Santa Monica Mountain live-forever (*Dudleya cymosa marcesens*), Santa Susana tarweed (*Hemizonia minthornii*), and Lyon's pentachaeta (*Pentachaeta lyonii*) can be found which fit into the endangered species category. Each of these species is protected by Federal and/or State law. The Federal Endangered Species Act of 1973 provides protection for all of the species above except the Belding's savannah sparrow. The California Endangered Species Act of 1970 provides protection for all of the animal species covered by Federal Law, and, in addition, the Belding's savannah sparrow. However, California State Law does not cover endangered plant species.

Although none of the animal species above are known to breed within the Study Area, they nevertheless utilize it as a component of their habitat. Known populations of endangered plant species are known from three localities. Following is a brief discussion of the endangered species and their occurrence within the Study Area.

California Condor

This species once ranged over much of western North America from British Columbia to Baja, California. Its numbers are now reduced to approximately 40-50 birds. Nesting of this species is confined to the inaccessible regions of the Coast Range Mountains in San Luis Obispo, Ventura, and Santa Barbara Counties. However, it is known to forage for food in undeveloped foothill, desert, and mountain areas of western Los Angeles County, including portions of the Study Area.

American Peregrine Falcon

The American peregrine falcon is now extinct as a breeding bird east of the Rocky Mountains and is very uncommon as a breeder in the west. In California, this subspecies breeds only along the coast and in the higher inland mountains. In 1975, only eight breeding pairs were reported. Active nests are no longer known from Ventura or Los Angeles Counties. However, members of this subspecies may occur in the Study Area as transients or winter residents.

Southern Bald Eagle

This subspecies occurs statewide, particularly along the coast and in interior California near large lakes, rivers, and marshes. Nesting is now restricted to the northern half of the state where, in 1974, only eighteen pairs of southern bald eagles produced young in California. More recent counts are currently unavailable. This species is expected to occur in the Study Area as a transient or possibly as a winter resident.

California Brown Pelican

The California brown pelican occurs along the entire Pacific Coast from Canada to Mexico; however, nesting in California is restricted to Anacapa Island. Currently 400 pairs of pelicans nest there. Outside of the breeding season this subspecies can be found along the entire Study Area coastline.

California Least Tern

The overall distribution of this subspecies of least tern is widespread due to its migratory behavior and includes the Pacific Coast from San Francisco Bay to central Baja California, and possibly areas of Central and South America. Local breeding colonies are located at Ballona Creek and Terminal Island in San Pedro. This subspecies is expected to occur along the Study Area coastline during its migrations.

Light-footed Clapper Rail

Found only in Southern California salt marshes, the light-footed Clapper Rail ranges from Goleta Slough south San Quentin Bay in Baja California. Breeding populations along the Southern Calfornia coast include Mugu Marshes, Anaheim Bay, Upper Newport Bay, Tijuana Estuary, and remnant salt marshes in Mission and San Diego Bays. Total population in California in 1975 was estimated to be 250 birds. This subspecies is expected to occur along the Study Area coastline during its migrations.

Balding's Savannah Sparrow

This avian species occurs as a resident in the tidal estuaries of Southern California, Baja California, and Mexico. The extent of pickleweed habitat (subject to tidal influences) may be responsible for the limited distribution of the Belding's Savannah Sparrow. Only eleven breeding sites are known to exist from Santa Barbara to San Diego Counties. This subspecies will occur within the Study Area at Malibu Lagoon as a non-breeder.

Santa Monica Mountain Live-Forever

This plant species is found on shaded rocky slopes within the chaparral community. An endemic species, this plant occurs in stable yet highly restricted populations. Within the Study Area, this species has been located in Little Sycamore Canyon.

Santa Susana Tarweed

This small, aromatic shrub is also an element of the chaparral community and is endemic to California. This species is known to occur in the Santa Susana Mountains in small numbers and is presently declining.

Lyon's Pentachaeta

Found in valley grasslands in small numbers, this slender annual is endemic to California. Within the Study Area, a population of this species is found near the head of Zuma Canyon between Mulholland Highway and Latigo Canyon Road.

Areas of Special Biological Significance

As can be seen from the preceding discussion, the Study Area possesses a high diversity of biological resources. Many of these are in excellent condition and represent some of the few high quality examples of their type remaining in the region. Others, although often very restructured or in poor condition, are important because they represent some of the only examples of their type remaining in the region. The significance of these resources has been recognized by various conservation groups and planning agencies for several years. Their individual efforts to document and plan for the preservation of these resources have resulted in the publication of several studies identifying "areas of special biological significance". These studies include the Southwest Mountain and Valley Province Landscape Preservation Study (Royston, Hanamoto, Beck, and Abey, 1973), the Los Angeles County Significant Ecological Area Study, 1976 (England and Nelson, 1976), the Inventory of California Natural Areas (Hood, 1975), the California Coastal Plan (California Coastal Zone Conservation Commission, 1975) the Inventory of Rare and Endangered Vascular Plants of California (California Native Plant Society, 1974) and a survey by the Nature Conservancy (Brown, personal communication). Areas of special biological significance identified in these studies have been mapped in Figure 36. In many cases there was partial or complete overlap among the studies. For this reason, it was often necessary to draw boundaries around a concentrated group of areas and discuss their significant resources as a whole. Twelve areas representing individual designations or a group of designations are found within the Study Area.

These areas and the studies in which they are identified are described below. Resource descriptions were prepared from information contained in these documents. Although most designations are advisory only, all of these areas possess biological resources which represent a sensitive and significant component of the existing environment and should be considered as major constraints.

Southwest Mountain and Valley Province Landscape Preservation Study

This study was prepared in 1973 for the California Department of Parks and Recreation to identify and rank areas possessing valuable scenic, scientific, and educational resources for the eventual addition to the State Park System. The study was for policy guidance only.

The identifying criteria and methodology of the study were intended to select sites in the province which possessed examples of natural resources in their "pristine" state that were suitable for acquisition by the Department of Parks and Recreation. Additionally, the selection process was intended to identify areas which together represented a total cross-section of the natural diversity within state including common and rare or unusual resources. Sixty-seven areas were designated in the State. Three such areas have been identified within the Study Area. All have been rated as high priority acquisition sites.

Inventory of Rare and Endangered Vascular Plants of California

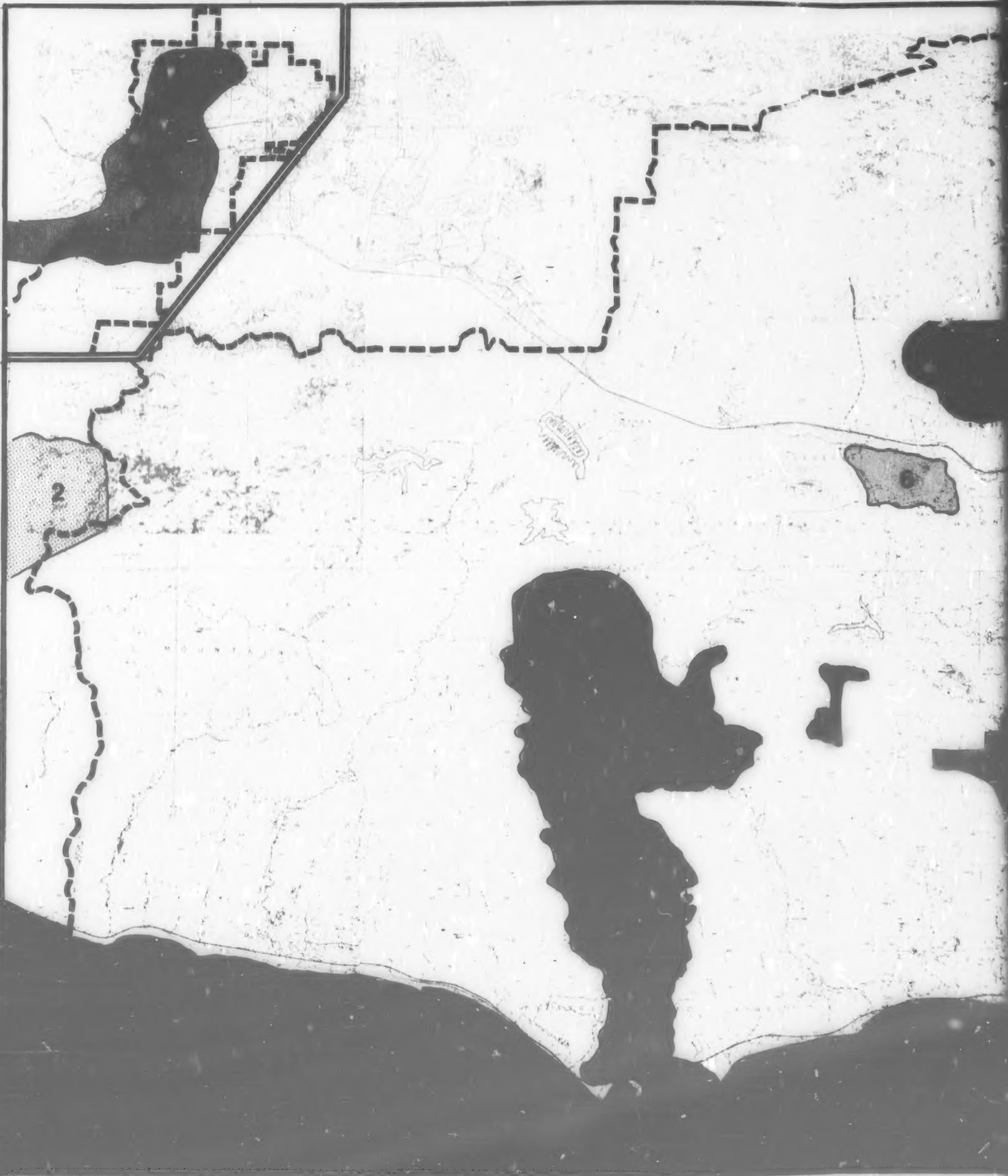
This study represents almost seven years of effort by professional and amateur botanists participating in the Rare Plant Project of the California Native Plant Society. The purpose of this project was to locate and identify populations of California's rare plants so that action could be taken to preserve them and their status could be monitored. This is one of the first programs of its kind in the Country.

To be included, a plant must be a native and rare in California. However, it does not have to be a California endemic. Although the Inventory is advisory only, most of the species included are also found on the list of legally protected plants maintained by the Federal government.

Populations of three rare and endangered plant species are found within the Study Area. All three are also found on the officially recognized Federal list.

Inventory of California Natural Areas

The Inventory of California Natural Areas was published in 1975 by the California Natural Areas Coordinating Council. This organization is a non-profit California corporation, established in 1969 to prepare an inventory of natural resource areas within California and to seek to protect them. The Council is directed by several prominent professional scientists; however, the study represents the work of over 300 professional and amateur scientists and naturalists.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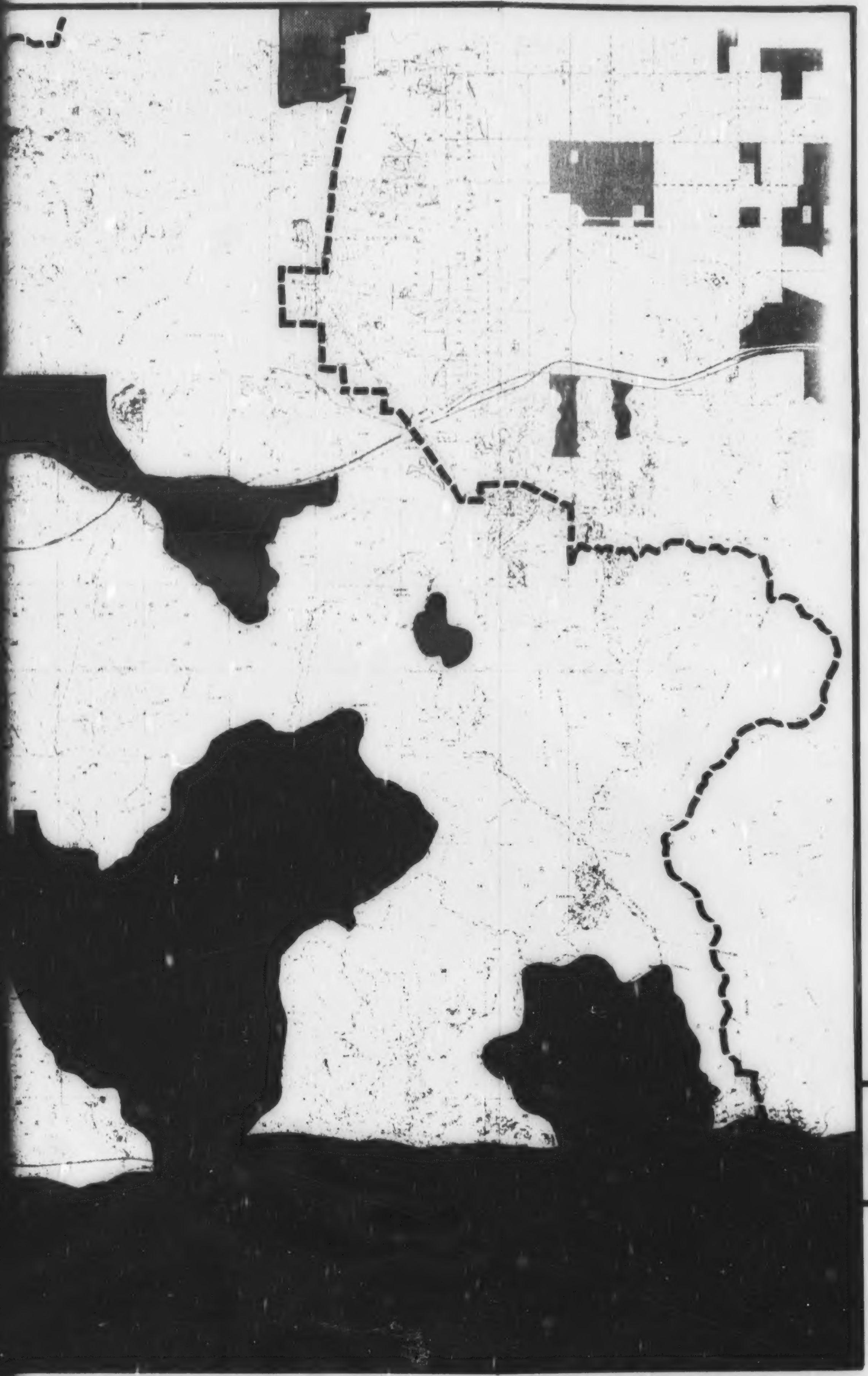
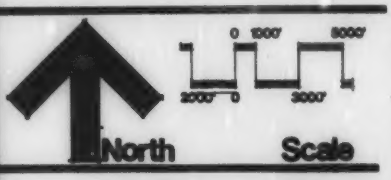


EIS/EIR
Las Virgenes-Triunfo
Malibu-Topanga
Area Wide Facilities Plan

Legend

1. santa susana mountains
2. upper sycamore canyon
3. zuma and upper la sierra canyons
4. point dume
5. fern, medenhall, and lost cabin canyons watershed area
6. las virgenes
7. lower palo comado, cheeseboro, and virgenes canyons
8. simi hills
9. malibu and cold creek canyons
10. calabasas highlands
11. tuna and pena canyons
12. malibu coastline

key to inset



bio. significance

fig.36

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The areas selected for inclusion fall into two general categories. The first are those areas which possess resources that are unique or are of scientific or educational interest. These include the habitats of rare or endangered species, relict or disjunct populations, significant paleontological sites, noteworthy geological features, and type localities of soils, animals, or plants. The second are those which possess representative examples of one or more biotic communities. Often, several representative sites of each community have been included to provide geographical diversity. The data on each area is carefully documented and reviewed by competent professionals before inclusion, and the Inventory is edited periodically to omit any areas which have lost their specific value or have been replaced by better examples.

The inventory is the first statewide catalog of natural areas. Its purpose is not simply to record these resources, but to serve as a guide and basis for a comprehensive and coordinated effort to protect the diversity of California's landscape and natural resources. In this capacity it is of use to all entities concerned with land use policy and preservation of the State's natural resources including local, State, and Federal government agencies, private firms, conservation organizations, and educational institutions. The California Natural Areas Coordinating Council has identified twelve natural areas within the Study Area.

Los Angeles County Significant Ecological Area Study, 1976

This study was prepared for the Los Angeles County Department of Regional Planning to locate areas which, due to their high biological resource value, should receive special consideration during the formulation of the 1976 Los Angeles County General Plan. The overall goal of the study was to define and identify significant ecological areas within the County, and to develop planning and management practices to protect, enhance, and utilize these resources in ways that are compatible with adjoining land uses.

The selection process entailed using a set of criteria to determine the ecological significance of an area. These included the habitat of rare, endangered, or threatened plant and animal species that are either one of a kind, or are restricted in distribution on a regional basis; habitat that at some point in the life cycle of a species or group of species, serves as a concentrated breeding, feeding, resting, or migrating grounds-and is limited in availability;

biotic resources that are of scientific interest because they are either an extreme in physical/geographical limitations, or they represent an unusual variation in a population or community; areas important as game species habitat or as fisheries; and areas that would provide for the preservation of relatively undisturbed examples of the natural biotic communities in Los Angeles County.

Areas meeting these criteria were located through an extensive review of available literature and a survey of over 200 qualified scientists and other concerned citizens in government agencies, academic institutions, and conservation groups. Over 115 sites were recommended for inclusion as significant ecological areas in Los Angeles County. Of these, sixty-two were selected for the final listing. Twelve of these fall within the Study Area boundaries. In addition to these, all riparian woodland communities in the County were identified as possessing significant biological resources.

California Coastal Plan

The California Coastal Zone Conservation Act of 1972 (Proposition 20) established the California Coastal Zone Conservation Commission and gave it the responsibility to prepare a comprehensive program for the orderly, long-range conservation and management of the coastal zone. The California Coastal Plan outlines such a program.

The plan was developed in nine separate elements and completed in December 1975. Two of these elements concerned themselves with marine resources and the coastal land environment. Combined they identified environmentally and biologically sensitive areas within the coastal zone. These include "Areas of Special Biological Significance" as identified by the State Water Resources Control Board; rare and endangered species habitat as identified by the California Department of Fish and Game; coastal wetlands and estuaries; marine, wildlife, and research reserves; rocky intertidal habitats; and wilderness and primitive areas. A large area within the study has been designated as Special Land Habitat and nearly the entire coastline is identified as a Special Marine Environment.

Nature Conservancy

The Nature Conservancy is a non-profit membership corporation founded in 1946 to preserve natural areas for present and future generations. Although this source is not a study in the true sense of the word, this organization identifies lands with scientific and educational value to acquire in cooperation with colleges, universities, and conservation groups. One area within the study boundaries is now being considered for acquisition by the Nature Conservancy.

Areas of special biological significance are described below. Their numerical listing corresponds to the numerical system used in Figure 36 and is not intended to reflect rank or prioritization.

1) Santa Susana Mountains - This area has been designated as a natural area by the California Natural Areas Coordinating Council. It includes a portion of the Santa Susana Mountains. The reasons for its inclusion in their inventory were unavailable at the time of this writing. However, the California Native Plant Society has identified populations of an officially recognized endangered plant species, Hemizonia minthornii, at five scattered localities within the area. Two of these localities were from recent observations. The status of the other three are not currently known.

2) Upper Sycamore Canyon - The California Natural Areas Coordinating Council has included this area in their study. Information on the resources of the area was unavailable at the time of this writing. Only a very small portion of the property is within the Study Area.

3) Zuma and Upper La Sierra Canyons - This relatively large area represents a composite of adjacent and overlapping lands identified as having special biological significance by several sources. These sources include the Nature Conservancy, the Los Angeles County Significant Ecological Area Study, the California Coastal Plan, the Inventory of California Natural Areas, the Southwestern Mountain and Valley Province Landscape Preservation Study, and the California Native Plant Society Rare Plant Project.

   This area covers a large portion of the Zuma Canyon watershed and neighboring lands. This canyon is one of the last major drainages in the Santa Monica Mountains that has perennial streamflow and remains in a relatively undeveloped condition. Hillsides support coastal sage scrub and chaparral. The canyon floor possesses a rich riparian community that is more extensive and in better condition than neighboring canyons. The perennial stream also supports diverse and abundant wildlife populations including mountain lion, which are becoming increasingly uncommon in the region. Populations of two endangered plants, Pentachaeta lyonii and Dudleya cymsoa, are also found in the northeastern portion of the area.

Upper La Sierra Canyon contains an unusually rich and diverse stand of canyon flora. The Creek Dogwood (Cornus glabrata), which is only found at one other site in the County, is abundant. The Giant Chain Fern (Woodwardia fimbriata), which normally reaches heights of 5 1/2 to 6 1/2 feet, is 8 to 9 feet tall at this locality. This species is only found at four other localities in the Santa Monica Mountains. The Humboldt Lily (Lilium humboldtii) also reaches heights of 9 feet at this locality. Accompanying this unusual stand of canyon vegetation is a healthy woodland community. Big-leaf Maple (Acer macrophyllum) reach heights of 60 feet, surrounded by dense stands of Coast Live Oak (Quercus agrifolia) and California-lauren (Umbellaria californica). This dense aggregation of uncommon species makes the area genuinely unique.

4) Point Dume - This area includes major drainages, sandy beaches, and rocky intertidal habitats on Point Dume which have been included in the Los Angeles County Significant Ecological Area Study, the Coastal Zone Plan, and the Inventory of California Natural Areas. Point Dume is one of the few remaining areas in the region where a diverse and healthy mixture of terrestrial and marine habitats can be found in close opposition.

Marine habitats here include a variety of rocky and sandy shorline types in combination with nearshore kelp beds. Due to strong upwelling of nutrient rich waters, the biota here is highly diverse and productive.

Two terrestrial communities are present. Coastal dune scrub is found on sandy beaches below the high bluffs found along the coast here. Populations of Coreopsis gigantea and Dudleya caespitosa, although not endangered, are significant because they find the southern limit of their range here. Several small drainages which support coastal sage scrub cut through the bluffs and extend inland. The unique geographic position of Point Dume increases the value of this habitat. This headland extends into the Santa Monica Bay considerably further than the rest of the surrounding coastline. Located in the Pacific Flyway, it serves as an important resting point for land birds migrating across the Bay.

5) Fern, Medenhall, and Lost Cabin Canyons Watershed Area - This area has been designated in the Los Angeles County Significant Ecological Area Study as a buffer critical to the preservation of valuable biological resources within Malibu Creek State Park. The park includes several small canyons possessing uncommon and fragile flora. This area includes portions of these canyon watersheds which lie outside the park. Its preservation is necessary to maintain these sensitive resources.

6) Las Virgenes - The Los Angeles County Significant Ecological Area Study has identified this area to the southeast of Malibu Junction as containing a number of floral species common to interior Southern California, but found nowhere else in the Santa Monica Mountains. The most notable of these are the California juniper (Juniperus californica) and Happlopappus linearifolius, a shrub characteristic of the interior hills and desert ranges.

7) Lower Palo Comado, Cheeseboro, and Virgenes Canyons - This area includes the lower portions of Palo Comado, Cheeseboro and Virgenes Canyons, north of the Ventura Freeway, and upper McCoy Canyon south of the freeway. The area supports some of the last examples of southern oak woodland savannah of significant size in Los Angeles County. Other oak woodland habitat can be found on steep hillsides in the area; however, the savannah here is a distinct sub-community growing on gently rolling hills with an open grassy understory. The area was included in the Los Angeles County Significant Ecological Area Study.

8) Simi Hills - This area, located at the eastern edge of the Simi Hills, has been identified by the Los Angeles County Significant Ecological Area Study as containing relatively undisturbed examples of chaparral, coastal sage scrub, southern oak woodland, and riparian woodland. This is one of two areas in the western edge of the County which includes the cismontane associations of these communities.

9) Malibu and Cold Creek Canyons - This area included most of the Malibu Creek watershed on the coastal side of the Santa Monica Mountains and contains four areas identified in the Inventory of California Natural Areas, two areas recommended for acquisition in the Southwest Mountain and Valley Province Landscape, three areas included in the Los Angeles County Significant Ecological Area Study, and a Special Land Habitat designated by the California Coastal Zone Conservation Commission.

This area contains Malibu Lagoon, the only lagoon remaining in the region. The nearest lagoon to the north is at Point Mugu in Ventura County, and the nearest to the south is Anaheim Bay in Orange County. The lagoon is brackish and supports salt marsh vegetation. It serves as an important bird refuge where over 200 species rest and feed. The salt marsh is dominated by pickleweed (Salicornia sp.) which serves as valuable non-breeding habitat for Belding's savannah sparrow. This species is classified as endangered by the California Department of Fish and Game.

The perennial stream in Malibu Canyon supports excellent oak and riparian woodland with an unusual variety of tree species. Black cottonwood (Populus trichocarps) and leather-leaf ash (Fraxinus velutinavar coriacea), uncommon in this region, are found here. In addition, the canyon bisects the Santa Monica Mountain Range and, as a result, plant species normally restricted to the drier interior valleys extend their ranges down the canyon and grow in association with coastal species. This has created a very unique flora here. A similar situation is found in the Hepatic Gulch area below Saddle Peak.

Constant micro-slumping of the developing soil has created a variety of micro-habitats in close proximity to one another. A unique ecological relationship results where moisture dependent ferns and mosses grow next to drought adapted succulents.

One additional area possesses outstanding botanical features. This is the area around the head waters of Cold Creek. This is a relatively undisturbed natural sandstone basis with springs and a perennial stream. The extreme range in physical conditions, from wet streamed to dry rocky ridges, makes the area showplace for native vegetation. Excellent stands of chaparral, southern oak woodland, coastal sage scrub, and riparian woodland are all found in the area. Several plant species that are uncommon to the general region are found here. These include stream orchis (Epipachis gigantea), red mimulus (Mimulus cardinalis), Humboldt lily (Lilium humboldtii var ocellatum), big-leaf maple (Acermacrephyllum) and red shank (Adenostema sparsifolium). The presence of several treesized flowering ash (Fraxinus dipetala), reaching 40 feet in height, is an additional unique botanical oddity. This shrub species has a normal maximum height of 15 to 20 feet.

10) Calabasas Highlands - This area has been designated by the California Natural Areas Coordinating Council in their Inventory of Natural Areas. Reasons for its inclusion in their study were not available at this writing.

11) Tuna and Pena Canyons - This area includes Tuna and Pena Canyons. These drainages are two of the few coastal drainages in the Santa Monica Mountains that have not sustained development in the watershed, or between the canyon mouth and the coastline. As a result of this, and the coastal exposure, the biotic communities here are in excellent condition. Most notable of these is the riparian vegetation supported by the year-round stream in Tuna Canyon. This community includes a stand of white alder (Alnus rhombifolia), which is uncommon in the region. It is also very important to migratory bird species.

12) Malibu Coastline - This area includes nearly the entire coastline of the Study Area. As a result of its relatively undisturbed condition, upwelling of nutrient-rich waters, and the presence of a variety of habitats, portions of this area have been included in the California Coastal Plan as a Special Marine Environment, the Los Angeles County Significant Ecological Area Study, and in part in the Inventory of California Natural Areas.

The area possesses some of the best kelp habitat south of Santa Barbara. These areas may be 100 times more productive than adjacent sand bottom communities, and provide refuge, food, and nursery grounds for thousands of species. Rocky outcrops alternate with sandy stretches along this coastline, and are found to a depth of 600 feet. Point Dume is the only place where rocky intertidal habitat occurs between Palos Verdes Peninsula and well into Ventura County. This coastline also possesses the only complete, undisturbed sandy beaches remaining in Los Angeles County.

2.2.9 Fire Hazard

The environmental conditions of the Santa Monica Mountains make the area particularly susceptible to major wildfires. Forty-seven major wildfires --those greater than 100 acres -- have burned a total of some 249,409 acres over a forty year period.

Most of the mountainous portions of the study area are classified as critical fire hazard areas. State Division of Forestry studies have concluded that criteria for this classification are: (1) fuel-loading, i.e., the quantity of flammable vegetation per unit of land area; (2) weather; and (3) slope.

Chaparral and coastal sage-scrub -- the most prevalent vegetative communities in the study area, have high relative combustibility rating. Fuel-loading for most of the area is above 20 tons per acre, and frequently above 40 tons per acre. Forty-five percent of the land has a slope of greater than 35%.

Weather reports of the past ten years place the area in Class III of the Critical Fire Weather Frequency, an index of the number of days per year fire hazard is critical. Class III is the highest rating and is defined as a frequency of more than 9 days per year.

In simpler terms, highly combustible vegetation, dry climate, strong winds from the northeast, and a rugged terrain increase the risk of a major fire. This is especially true in September, October, and November, during Santa Ana wind conditions just before the first rains. Fires during this period usually start inland and are fanned by these Santa Ana winds of 50-60 mph into the steep canyons which can accelerate the front up to speeds of 100 MPH. The speed and heat of the fire is so intense that firefighters can only attempt to prevent lateral spread of the fire while waiting for the winds to abate or the fuel supply to diminish.

According to the Los Angeles County Deputy Forester, most development in the study area is within areas of adequate fire protection, although some structures have not been constructed according to fire ordinances. Brush control, construction, and water system ordinances are now being enforced to improve the situation and insure adequate fire protection for future development.

Fire Hazard Criteria

A fire hazard severity classification system has been developed by the California State Division of Forestry and published in 1973. This classification system has been utilized by both the Ventura County Planning Division of the Environmental Resources Agency and the Los Angeles County Regional Planning Commission in preparation of the safety elements of their General Plan. The Fire Hazard Map, Figure 37, is a composite of fire hazard mapping by these two agencies. The various designations refer to possible combinations of vegetation, climate, and slope. Low hazards refer to combinations of areas of little or no vegetation with areas of flat or low slope and low critical fire weather frequency. Extreme hazards refer to areas of heavy vegetation or "fuel loading" combined with areas of steep topography (41 percent to 60 percent and above) and extreme fire weather frequency. The following is a discussion of the individual fire hazard factors.

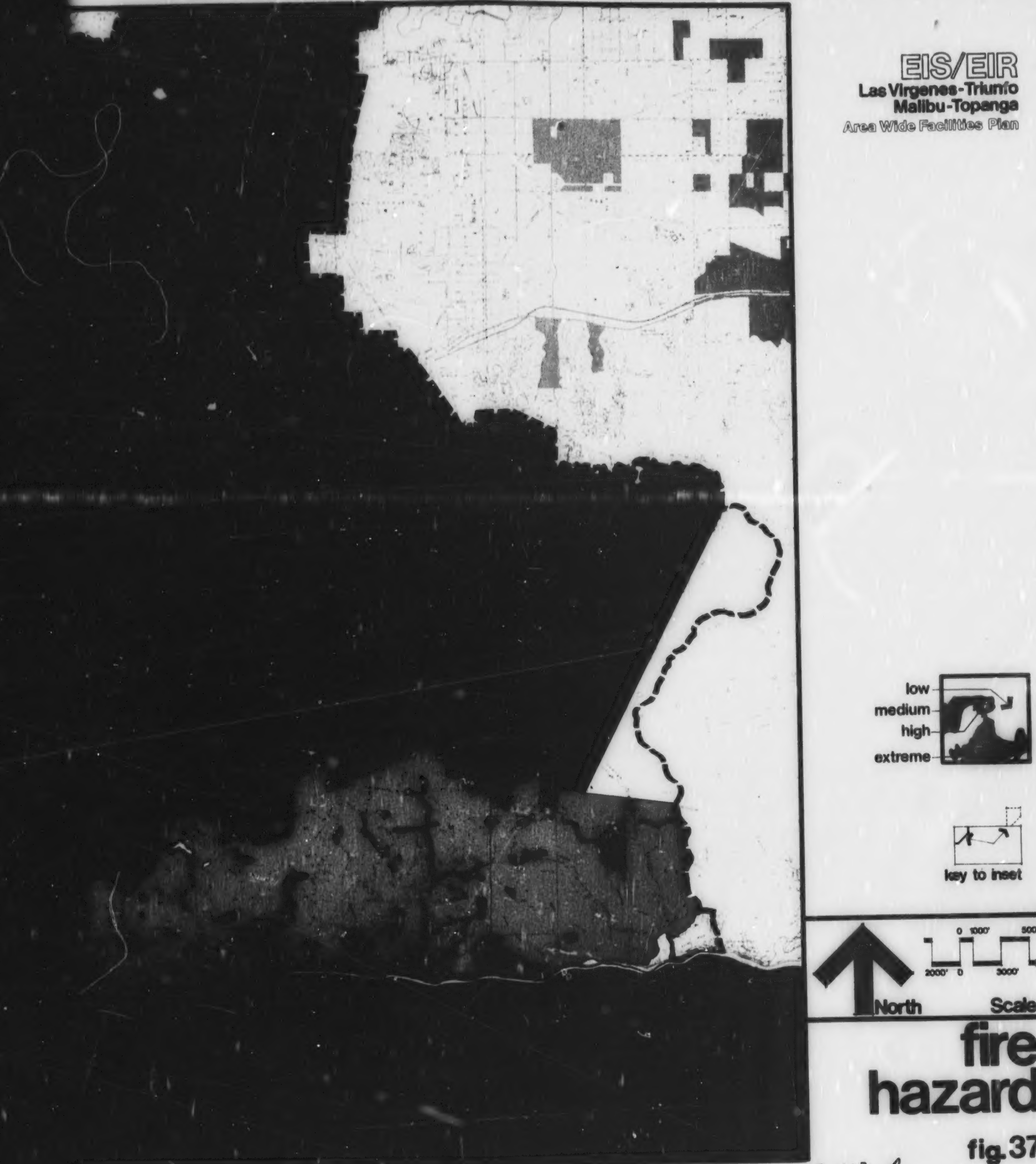
Vegetation: Plant species indigenous to the chaparral and coastal sage scrub communities are highly combustible. They have adapted to arid conditions and contain considerable amounts of volatile oils. Both of these plant communities are classified as high combustibility by Los Angeles County fire officials.

The southern oak woodland community has medium combustibility, while riparian and woodland communities have low combustibility. Other plant communities are not ranked.

Fire officials use a measurement termed "fuel-loading" to determine the amount of fuel each vegetation type will yield. In a State Division of Forestry report referred to as Operation Firestop, the following data were included.

		Fuel-Loading (Tons/Acre)	
Plant Community	Species	Range	Average
Coastal Sage-Scrub	Buckbrush	7.31-32.54	
	Chamise	12.42-17.09	17.33
	Calif. Sage	7.31-32.54	
Chaparral	Scrub Oak Toyon	27.19-46.84	36.96

EIS/EIR
Las Virgenes-Triunfo
Malibu-Topanga
Area Wide Facilities Plan


low
medium
high
extreme
key to inset
North
0 1000' 5000'
2000' 0 3000'
Scale

fire hazard

fig. 37

2-113-A

Climate: Fire hazard is most severe during Santa Ana conditions until rains arrive in mid-November. While the low humidity contributes to the fire potential, the high winds are more critical. In the study area, winds of 50-60 MPH are common and can accelerate to 100 MPH during major conflagrations. In the compilation of Fire Severity Classification system, the Division of Forestry found that the study area had one of the highest Fire-Load Index (FLI) ranks for California. FLI is used to determine critical fire weather. Measurements of wind, relative humidity, and precipitation are taken at 354 weather stations, and are averaged for 151 "Fire Danger Rating Areas". These are geographical areas of similar climate. The combined effects of weather elements on potential fires are calculated daily for each Fire Danger Rating Area as a series of indexes, defined in California's interagency Wildland Fire Danger Rating System. This system predicts the probability of a fire occurring (Fire Occurrence Index), and, should a fire occur, its probable rate of spread and intensity (Burning Index). These two indexes are combined into a Fire Load Index, on a scale of 0 - 100, which estimates the potential job load each day for each Rating Area. The scale is linear; thus an index of 60 means twice the expected fire load of an index of 30. An index of 28 to 39 means that the expected fire load is "Very High", and an index of 40 to 100 is "Extreme", which is the highest classification. In the study area, all of the fires greater than 5,000 acres occurred on days with an FLI of 28 or greater.

Slope: Fires in the study area usually begin inland and are funneled into the steep canyons where their speed accelerates. The effects of slope to fires are similar to those of winds, as explained in the Division of Forestry study.

Generally speaking, it can be said that small fires will burn faster upslope and slower downslope. However, during periods with a Fire Load Index over 40, high velocity winds will often override the influence of slope. Under those conditions fires not only will spread rapidly upslope, but downslope as well, especially down west-facing canyons during evening hours. Such fires have been known to travel across drainages as though those drainages did not exist. In addition to its wind-like influence on the rate of fire spread, slope also provides other reasons why small fires become large. Travel times for vehicles and men are generally longer in areas of steep topography since the few roads that exist are usually steep and winding. Slope often dictates the method of attacking the fire. As slope increases, the capability of mechanized equipment decreases, and slower, more indirect methods must be utilized. In steeper areas when it becomes unsafe to use hand crews, forces must be pulled back to the nearest road or ridge-top to construct firelines. Problems of fires spotting ahead of the main fire front and of rolling firebrands become greater as slope increases.

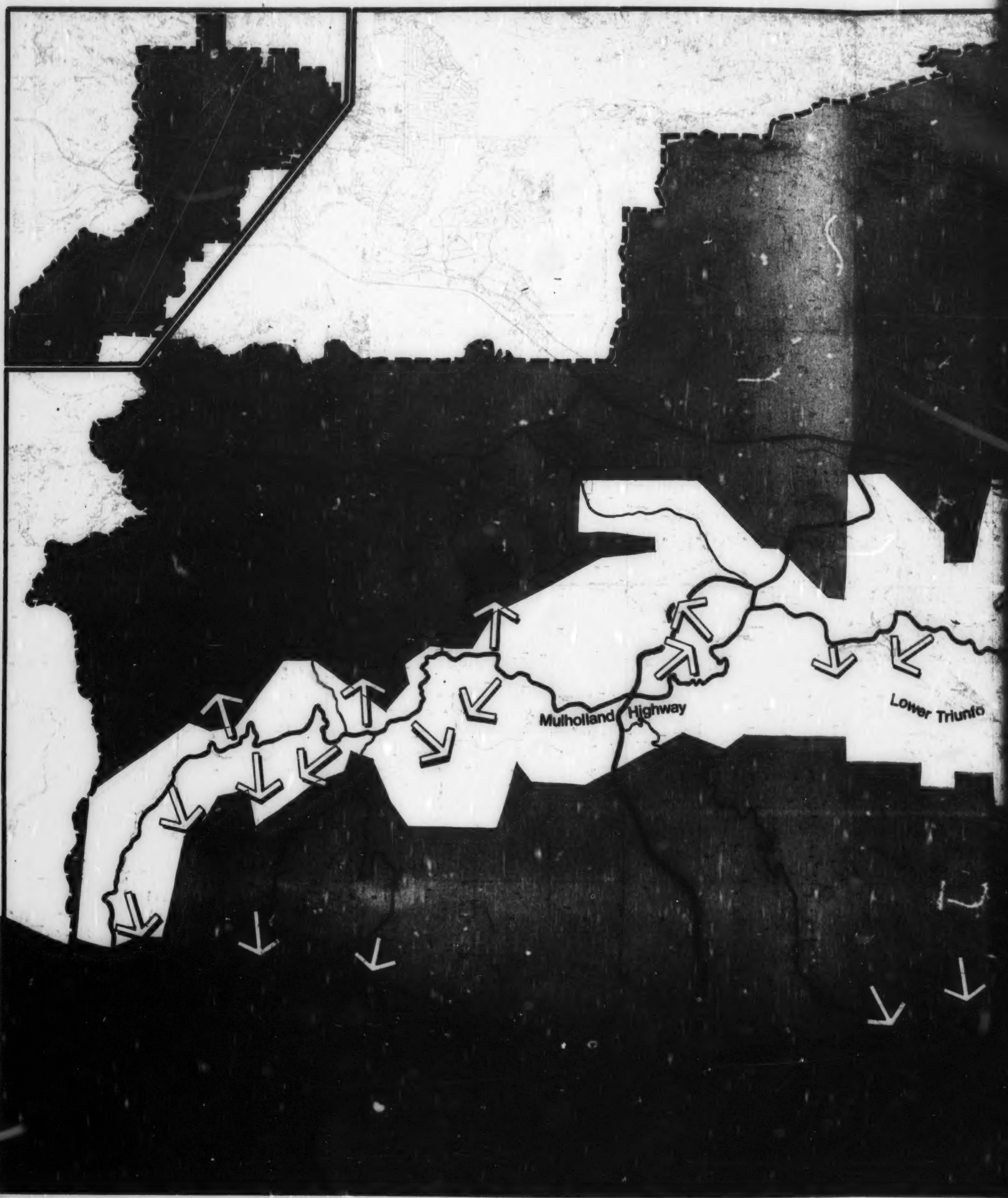
The type of firefighting or "attack" is dependent upon terrain conditions.

Class I (0-40% slope)	-	Direct attack possible with all-wheel drive firetrucks, bulldozers, handcrews and aircraft.
Class II (41-60% slope)	-	Beyond operating capability of all-wheel drive equipment. Drive attack methods still possible with bulldozers, handcrews, and aircraft.
Class III (above 60% slope)	-	Mostly beyond operating capability of bulldozers. Attack methods become more indirect. Handcrews and aircraft become primary tools.

2.2.10 Natural Scenic Features

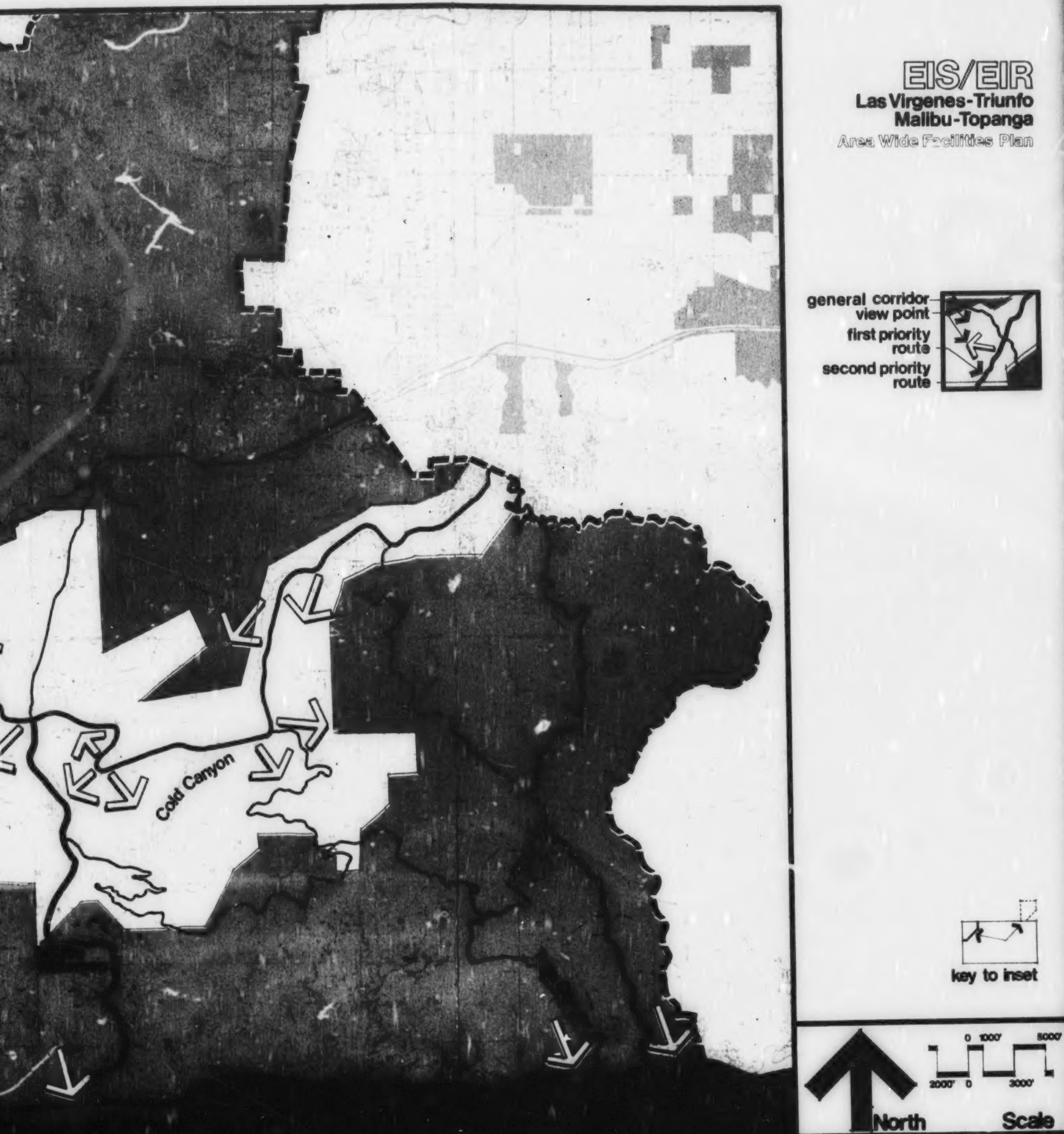
The study area has long been recognized as an abundant area of scenic features. The combination of mountains, valleys, vegetation, and bodies of water present numerous opportunities to view beautiful panoramas, scenes, and detail views. The area is rich with outstanding rock formations, trees, rugged canyons, valleys, and riparian areas. Interspersed among these features are numerous ranches, agricultural areas, and parks which present restful pastoral scenes. The coastline possesses a variety of sandy beaches, coves, and sea cliffs of prized scenic qualities. These all provide variety and visual relief from nearby urban areas.

A complete detail mapping of all scenic features and views within the study area would be extremely complex and impractical to complete. There does not appear to be any evidence that this has been developed by any other studies, however the scenic highway elements of the General Plans for Ventura County, Los Angeles County and City of Thousand Oaks and the Citizens' Advisory Committee Report on the Mulholland Scenic Corridor have proposed broad policies and guidelines for preservation of scenic qualities on certain roads and highways.


Mulholland Highway
Lower Triunfo

EIS/EIR

Las Virgenes-Triunfo
Malibu-Topanga
Area Wide Facilities Plan


Cold Canyon
general corridor
view point
first priority route
second priority route
key to inset
0
1000'
5000'
2000'
0
3000'
North
Scale

scenic features

fig.38

2-115-A

These studies have identified, on a broad basis, those areas meriting special consideration of scenic and aesthetic qualities for planning and development. These have been identified on the accompanying map. (See Figure 30.) The policies and guidelines pertaining to scenic and aesthetic qualities within this study area and as proposed by these agencies are summarized as follows:

Santa Monica Mountains Comprehensive Planning Commission

As part of the Santa Monica Mountains Planning Act of 1975, the Commission is to develop a regional plan for the conservation and development of the Santa Monica Mountains. One element of the plan is the Conservation Plan to preserve, develop, utilize and manage scenic and other natural resources in the mountains. The plan, expected to be completed in late summer 1978 has not yet designated specific scenic resources in the study area.

Los Angeles County Regional Planning Commmission and Mulholland Scenic Corridor Advisory Committee

The Scenic Highway Element of the Los Angeles County General Plan, adopted in 1975, identifies and recommends that the Mulholland Scenic Highway form the spine of a network of scenic highways in the Santa Monica Mountains. These highways, as shown on Figure 38 were proposed for further study to define corridors and develop appropriate guidelines and policies. Of these highways, the Mulholland Highway was placed on a first priority category, as was Malibu Canyon Road - Las Virgenes Road from Pacific Coast Highway to Mulholland Highway, and Dume Canyon Road -Kimberly Canyon Road, Kanan Road from Pacific Coast Highway to Ventura Freeway.

Additionally, the Citizesn Advisory Committee for the Mulholland Scenic Corridor issued a report in 1975 with recommendations and definition of the general corridor boundary. By mid 1977, the Citizens Advisory Committee was in the process of developing implementation ordinances for the scenic corridor. These ordinances should be ready for the public hearing process by the end of the summer, 1977. A few recommendations of the committee include requiring special grading techniques within the corridor boundaries to cause a minimum amount of disturbance to the natural terrain, and that the natural systems tributary to the Mulholland Scenic Corridor be protected and preserved by ordinance including all trees, vegetation, and watercourses.

Figure 38 illustrates the present proposed boundary of the scenic corridor within which these recommended policies would be in force.

Ventura County

Within the Ventura County portion of the study area, Yerba Buena Road and Potrero Road are major roads designated as part of scenic highway system. Specific corridor studies identifying significant scenic qualities or areas have not been completed nor have any specific controls been implemented.

City of Thousand Oaks

Within the primary study area, the City of Thousand Oaks has identified several roads to be included within the scenic highways element of their general plan. These include Potrero Road and Westlake Boulevard as they join with the Ventura County scenic highway system. Westlake Boulevard has been developed as a parkway and its scenic corridor is limited to a comparatively narrow, linear area. Potrero Road is an extension of the scenic highway designation given to it by Ventura County.

Others

In the Santa Monica Mountain Study developed by the Bureau of Outdoor Recreation in 1973, several specific areas were noted as having special scenic qualities. These areas were suggested to be consolidated with existing public parkland to guarantee public access and protection. These areas are:

Tuna Canyon	-	Small, scenic, coastal canyon of riparian association dominated with the finest stand of Red Alders in the study area.
Cold Canyon	-	Scenic area containing perennial stream.
Los Flores Canyon Saddle Peak	-	Summit of Saddle Peak and Branch Canyons
Ramirez-Zuma Canyon	-	Natural coastal canyons
Trancas Canyon	-	Rugged scenic coastal canyon
Mudd Ranch	-	Scenic area along Mulholland corridor
Lower Triunfo, Goat Buttes, Castro Peak	-	One of the most spectacular settings in the mountains.

Malibu Watergap	-	Spectacular gorge linking Malibu Lagoon to Lower Triunfo.
Nicholas Flat	-	Prime site with level land adjacent to Leo Carillo State Park with good scenic vistas.
San Nicholas-Los Alisos Canyons	-	Scenic coastal canyon with riparian vegetation

Several other areas have also been noted in the report, however, they are outside the study area.

Environmental Setting

Socio-Cultural Environment

2.3 SOCIO-CULTURAL ENVIRONMENT

2.3.1 Jurisdictional Framework

The jurisdictional framework of the study area is a complex of federal, state, and local agencies with varying responsibilities of regulation and provision of day to day services for the area.

The following is an outline of significant agencies including a brief description of their powers and responsibilities (specific services and facilities are described in more detail within pertinent sections of this report):

Federal

There are several agencies of the Federal government which provide funding, regulation, review or survey of environmental factors within the study area. Of these Federal agencies, the Environmental Protection Agency is currently the most directly involved in the area due to its involvement in this Areawide Facilities Plan. Other Federal agencies currently have little direct responsibility but are discussed here to describe their general responsibilities or interests in the area and to give additional background necessary to understand the existing conditions.

Environmental Protection Agency. The main concern of the EPA is the protection of environmental quality of all areas of the nation. The Clean Air Act Amendments of 1970 and the Water Pollution Control Act Amendments of 1972 give the EPA a certain degree of indirect control over any development having a potential of degrading environmental quality. The EPA, under the authority given to it by these acts, has developed and adopted air quality criteria for major pollutants, standards of emissions from various sources and, with the assistance of state authorities, has established air quality control regions. In water pollution control, the EPA has been directed to require and assist in development and implementation of waste treatment management plans and practices to provide application of the best practicable waste treatment technology before any discharge is made into receiving waters. The EPA also administers Federal grants for the construction of waste water treatment works and administers permit programs regulating any discharge of pollutants into the nation's waters.

It is the intent of the EPA that its use of these powers be for the protection and betterment of environmental quality and that it consider the broad environmental implications from any action.

Department of the Interior, Bureau of Outdoor Recreation. The Bureau of Outdoor Recreation in 1973 completed a study of the area (The Santa Monica Mountains Study) to determine the outdoor recreation potential of the area. In this study, the Bureau found that although the area possessed outstanding scenic, ecologic, and recreation resources, it concluded that the area could not be justified under existing Federal policy which dictates higher recreation carrying capacities than can or should be accommodated in the area due to physical site limitations. The study did recommend, however, that state and local authorities should prepare a comprehensive conservation and development plan for the area and that Federal programs and guidelines be managed and enforced in such a way as to assist in implementing a plan.

State

Within the governmental organization of the State of California, there are several agencies having direct interests in the study area. These are:

State Water Resources Control Board. This agency is responsible for administration and regulation of the water resources of the state. It coordinates function of water rights, water pollution and water quality so that all aspects can be considered when applications are granted for appropriation of water or water quality standards are established. It is also the agency administering Clean Water Grants at the state level.

The state has also created nine Regional Water Quality Control Boards acting under the State Water Resources Control Board to coordinate actions and administrate state policies pertaining to water quality control at a regional level and to formulate regional water quality control plans. The study area is within the jurisdiction of the Los Angeles Regional Water Quality Control Board, which has adopted a regional water quality control plan establishing goals and policies to be followed in the preparation of the Areawide Facilities Plan.

In compliance with the Federal Water Pollution Control Act, these agencies are also the Federally approved administrators of the National Pollutant Discharge Elimination System (NPDES) permit program regulating pollutant discharge into waterways.

State Department of Health. The Department of Health is the agency responsible for the regulation of safety, purity, wholesomeness and potability of domestic water supplies in the state. It further has the responsibility for assisting the State Water Resources Control Board and Regional Boards in setting quality standards of waste water discharge. Quality standards of water recreational areas such as ocean bathing areas and water quality in areas of shellfish harvesting are also regulated by this department.

In instances when health conditions of recreational areas become hazardous due to unsuitable water quality or when water quality conditions for shellfish create unsafe conditions for human consumption, the department can designate those areas as unsuitable for recreational use of the waters or shellfish harvesting.

State Air Resources Board. The Air Resources Board is the principal air pollution regulatory agency in the State. It is responsible for controlling emissions from motor vehicles, setting air quality standards, and coordinating efforts of local air pollution control agencies to control nonvehicular emissions. The Board has divided the State into eleven air basins comprised of various local air pollution control districts. The local air pollution control districts in the basin work together by coordinating councils comprised of representatives of the various districts.

The study area is within the South Coast Air Basin which has been designated as a critical air basin by the Air Resources Board. This designation indicates that an area will have problems in attaining or maintaining NAAQS by 1985. The State Water Resources Control Board in recognition of these concerns requires that planning of sewerage treatment facilities in critical air basins, utilize population projections assuming achievement of zero not-immigration to the State at some future time for project funding under Clean Water Grants.

State Department of Fish and Game. Under the Fish and Game code of the State, it is unlawful to deposit into, permit to pass into, or place where it can pass into the waters of the State, any substance or material deleterious to fish, plant life, or bird life. The Fish and Game code requires that the Department be notified of any proposed action that diverts or obstructs natural flow, or substantially changes the bed, channel or bank of any river, stream, or lake. If this action substantially affects an existing fish or game resource, The Department may propose alternatives to protect these resources and arbitrate an acceptable action.

State Department of Parks and Recreation. The Department of Parks and Recreation has recognized the scenic, ecologic, and recreation potential of large areas of land within the study area to be incorporated into the State Parks system. The Department has also prepared a Historical Preservation Plan in compliance with the Federal Historic Preservation Act of 1977.

State Resources Agency. Under the California Environmental Quality Act of 1970, the Resources Agency has adopted guidelines for procedures necessary to implement the Act and monitors adherence to Environmental Impact Reprot procedures.

State Department of Transportation. The State Department of Transportation (CALTRANS) has responsibility for planning and development of statewide transportation. At this time, a transportation study is underway for State Routes 1 and 64 (Pacific Coast Highway and Malibu Canyon Road). Preliminary problems, issues, and constraints have been developed and presented to the citizens along State Routes 1 and 64, however, no definite action has been taken by either the citizens or by CALTRANS.

Santa Monica Mountains Comprehensive Planning Commission. In the 1975-76 Regular Session of the California Legislature, Assembly Bill 163, which created the Santa Monica Mountains Comprehensive Planning Commission, was passed. The Legislature charged the 13 member Commission to study and develop a comprehensive plan for the conservation and development of the Santa Monica Mountains Zone. This regional plan, to be completed during the two year lift of the commission, will contain a land use plan, a transportation plan, a conservation plan, a recreation plan, a public services and facilities plan, and an economic element. Basically the zone includes most of the Santa Monica Mountains in Ventura and Los Angeles County, including the Malibu Creek watershed, and most of the Santa Monica Mountains within the City of Los Angeles including Griffith and Elysian Parks.

The commission is currently (July 1977) in the first phase of the work program which includes producing Sketch Plans for the Santa Monica Mountains Zone. The final plan will be reflective of one or more of the sketch plans.

California Coastal Zone Conservation Commission. With the passage of Senate Bill 1277 by the California legislature in 1976, a restructuring of the Coastal Zone Conservation Commission and the six regional commissions was accomplished. Major features of the new legislation include: termination of the regional commissions no later than January 1, 1981; requirement of cities and counties within the coastal zone to prepare a local coastal zone program; termination of permit authority of the commission or regional commission, with prescribed exceptions, over any area covered by an approved local coastal plan; and redefinition of the boundaries of the coastal zone.

The Coastal Zone refers to the seaward limits of the State's jurisdiction and extends inland to approximately 1,000 yards from the mean high tide line of the sea. In significant coastal areas the line extends inland to the first major ridgeline or five miles from the mean high tide line, whichever is less. It generally extends less than 1,000 yards in developed urban areas.[1]

Local

Southern California Association of Governments (SCAG). SCAG is a voluntary regional organization composed of six southern counties, Los Angeles, Orange, San Bernardino, Riverside, Ventura and Imperial, as well as 108 cities in those counties, and was formed to enable local governments to coordinate planning on a regional level. This agency has also been designated under the Federal Office of Management and Budgets, Circular A-95, as the area-wide agency to review applications for selected Federal grant programs. SCAG has been named the 208 planning agency for the Los Angeles - Orange Counties area (as of May 6, 1976). The 208 planning effort in this area is expected to concentrate on a Regional Planning Effort to control pollution from non-point sources, to maintain surface water quality and upgrade groundwater quality, and to coordinate air and water pollution control programs with local land use planning.

County

A majority of the study area is within the northwestern portion of Los Angeles County with the remainder in Ventura County. The following are significant County departments of both counties which have responsibilities in the study area.

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1. Senate Bill 1277, Section 1, Chapter 2, 30103 (a).

Planning.
Ventura County: Environmental Resources Agency, Planning Division.
Los Angeles County: Regional Planning Commission.

Public Health (pertaining to sewage and water quality.)
Ventura County: Environmental Resources Agency, Environmental Health Division.
Los Angeles County: County Health Department.

Air Quality.
Ventura County: Environmental Resource Agency, Air Pollution Control District.
Los Angeles County: Air Quality Maintenance District

Parks and Recreation.
Ventura County: Property Administration Agency, Parks Department.
Los Angeles County: Parks and Recreation Department

Flood Control.
Ventura County: Public Works Agency, Flood Control & Drainage.
Los Angeles County: Flood Control District.

Fire Protection.
Ventura County: Fire Services Agency.
Los Angeles County: Forester and Fire Warden.

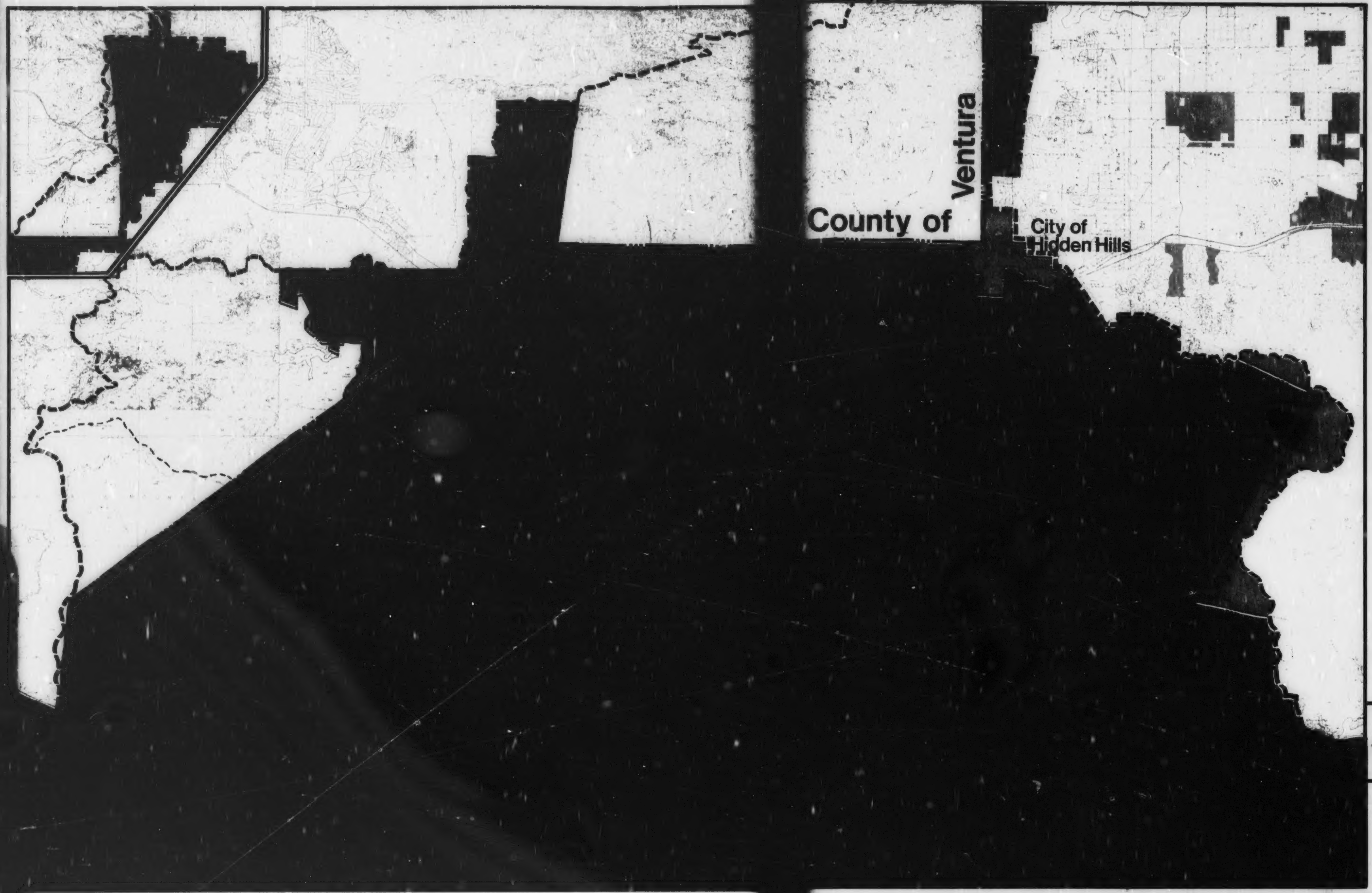
Municipalities

The entire city of Hidden Hills and a portion of the cities of Los Angeles and Thousand Oaks fall within the study area. Within the study area, the total land occupied by these three cities combined equal only a small percentage of the entire study area.

These three cities range from the small rural city of Hidden Hills, which has most of its municipal functions handled by the county, to the City of Los Angeles, which has a highly developed governmental organization. Thousand Oaks is a rapidly growing suburban community within a rural environment. All three cities, however, are similar in that any activities proposed within their limits or having an impact on their lands come under the review of their city councils.

In July of 1975 the Southern California Air Pollution Control District was formed by a joint powers agreement of the APCDS of all the Counties of the South Coast Air Basin with the exception of Santa Barbara and Ventura Counties. These latter counties however are still within the Air Quality Maintainance Area designation by the State Air Resources Board.

EIS/EIR
Las Virgenes-Triunfo
Malibu-Topanga
Area Wide Facilities Plan


County of Ventura
City of Hidden Hills
county boundary
city boundary
key to inset
North
0 1000' 5000'
2000' 0 3000'
Scale

jurisdictions
city,county

fig.39

Special Districts

Special districts are created under provision of various statutes, for the purpose of providing special services to people living within specific areas which will benefit from such services. They are particularly adapted to rural sections with population clustered in discontinuous remote areas.

There are three types of districts within the study area: (1) those whose affairs and funds are under the supervision and control of their own governing bodies; (2) those districts under the supervision and control of the County Board of Supervisors; and (3) school districts.

Special Districts with their Own Governing Bodies Independent of the Counties

Resource Conservation Districts. These districts are organized under the State Public Resources Code and authorized and directed to conduct research in and to advise and assist other public agencies and private individuals in the fields of land use planning, pollution control, and conservation of soil, water, woodlands, wildlife and other natural resources. There are three RCD's within the study area: Topanga-Las Virgenes, Ventura Area, and West Los Angeles.

Water Districts.

Metropolitan Water District of Southern California (MWD): Public agency governed by representatives of constituent water agencies such as Las Virgenes MWD. Supplies supplemental water to a 4,800 square mile area of the Southern California coastal plain including the study area. The constituent water agencies are water wholesalers able to purchase water from the MWD and supply water retailers. Water wholesalers that have direct or indirect responsibility in the area include: Las Virgenes Municipal Water District, a combined water delivery agency, also handling wastewater collection, treatment and disposal; West Basin Municipal Water District; and Callequas Municipal Water District. (Figure 40 indicates areas covered by major wholesalers.)

Water Retailers/ Purveyors are small districts or companies usually under county control which purchase water from the water wholesaling districts. Included under this category are:

L.A. County Waterworks District #29, Ventura County Waterworks District No. 8, Russell Valley Municipal Water District, Metropolitan Water Company, Lake Sherwood Mutual Water Company, Hidden Valley Municipal Water Company and Westlake Water Company.

Sanitation Districts.

Las Virgenes Municipal Water District: Within the jurisdictional boundaries of LVMWD and also under its authority are three improvement districts for sewage collection and treatment. Improvement District No. U-1 is within the upper Malibu Canyon Drainage Area and Improvement District No. U-2 is within the Calabasas Drainage Area, while Improvement District U-3 is located north of U-2 to the San Fernando Valley.

Triunfo County Sanitation District: The Triunfo County Sanitation District is a special district adjacent to LVMWD and totally within Ventura County. Its collection system ties directly into the LVMWD system which treats sewage at the jointly developed Tapia treatment plant.

Recreation and Parks Districts.

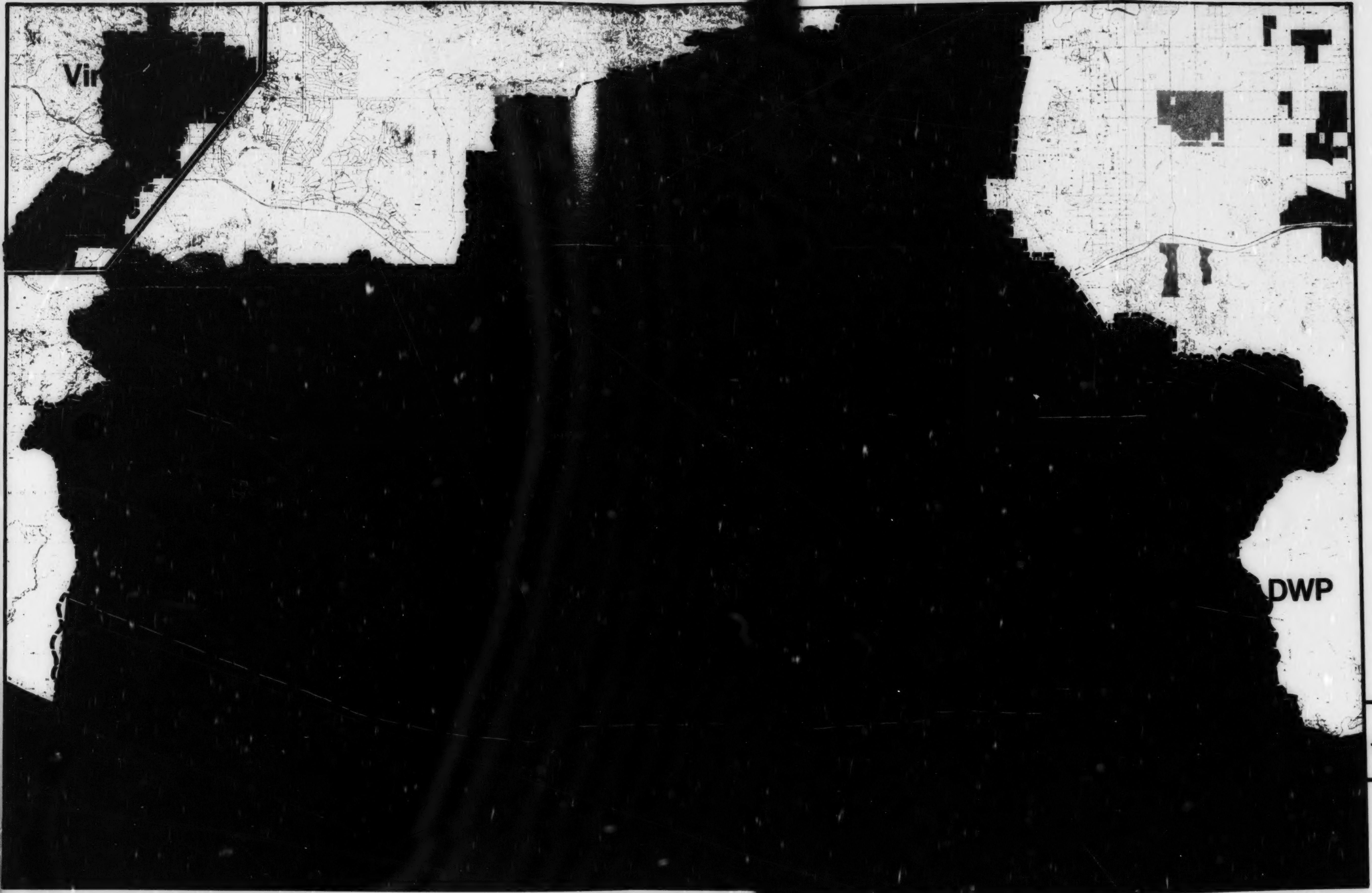
Conejo Recreation and Park District: Independent special district providing recreation and park services.

Simi Valley Recreation and Park District: Independent special district providing recreation and park services.

School Districts.

Los Angeles County: Las Virgenes Unified School District, Santa Monica Unified School District, and Los Angeles Unified School District.

Ventura County: Ocean View School District (Oxnard Unified High School District), Conejo Valley Unified School District, Simi Valley Unified School District.


Vi
DWP

EIS/EIR
Las Virgenes-Triunfo
Malibu-Topanga
Area Wide Facilities Plan

water district boundary ■

key to inset

0 1000' 5000'
2000' 0 3000'
North
Scale

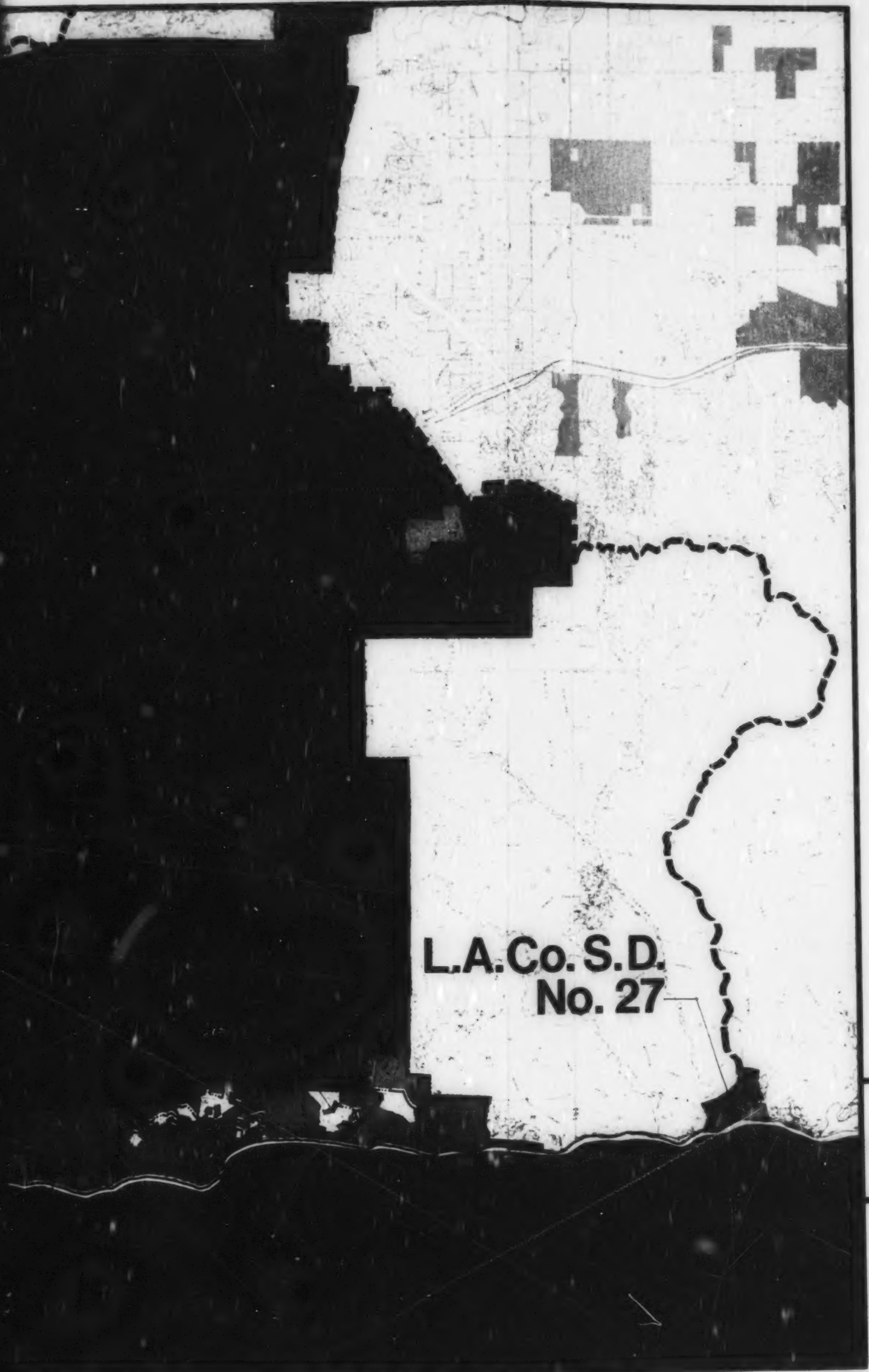
jurisdictions
water districts

fig.40

2-126-4

Las
MW

EIS/EIR
Las Virgenes-Triunfo
Malibu-Topanga
Area Wide Facilities Plan

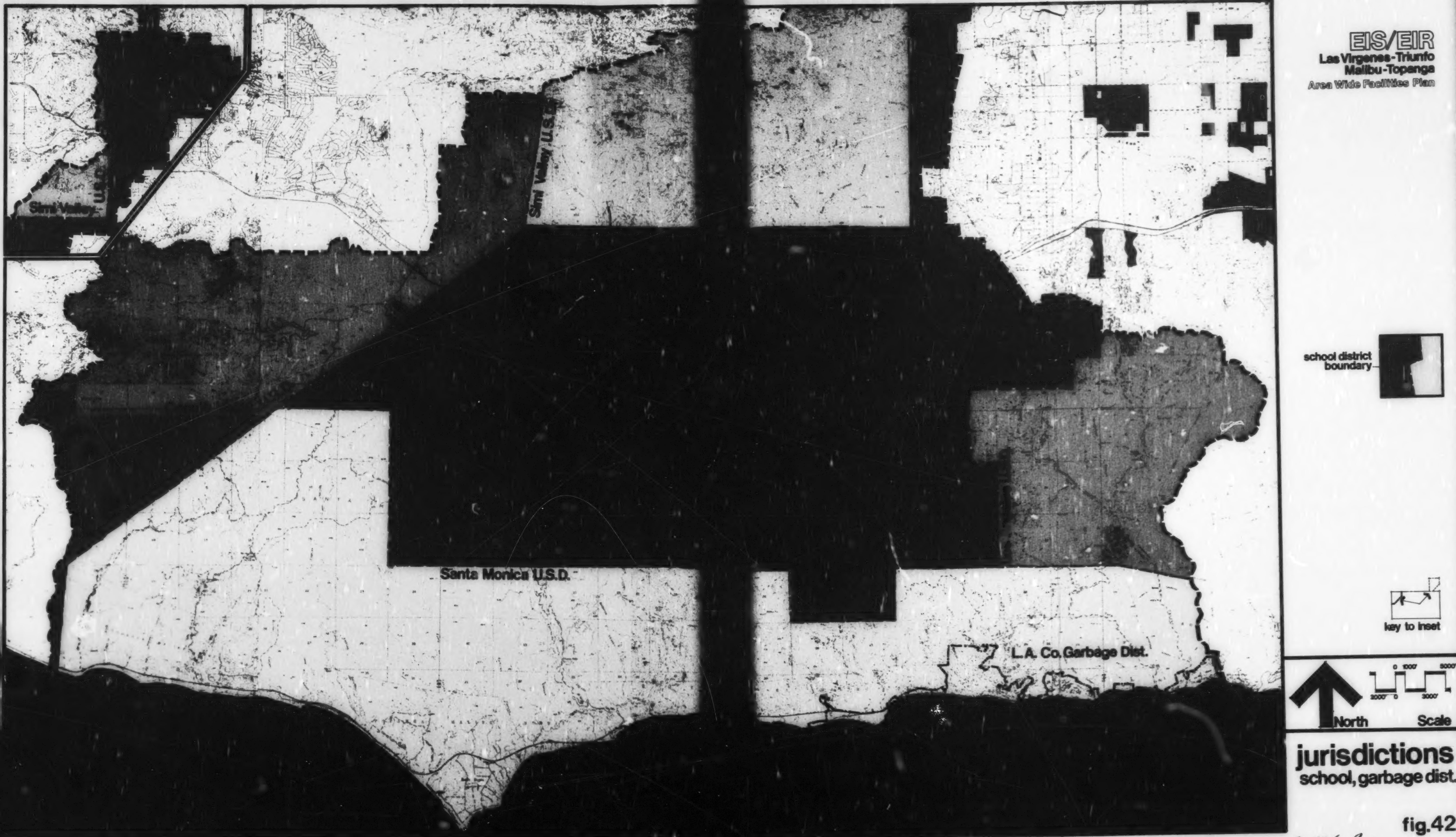

L.A.Co. S.D.
No. 27
sanitation dist. boundary
improvement dist. boundary
key to inset
North
Scale
0 1000' 5000'
2000' 0 3000'

jurisdictions
sanitation districts

fig.41

2-126-B

EIS/EIR
Las Virgenes-Triunfo
Malibu-Topanga
Area Wide Facilities Plan


Simi Valley
U.S.D.
Simi Valley U.S.D.
Santa Monica U.S.D.
L.A. Co. Garbage Dist.
school district boundary
key to inset
North
0 1000' 5000'
2000' 0 3000'
Scale

jurisdictions
school, garbage dist.

fig.42

2.126.C

2.3.2 Demographics

Recent population figures for the study area were obtained from adopted SCAG-76 population figures. The SCAG-76 forecast figures are lower than earlier population projections utilized in the Draft EIS/EIR.

Based on the adopted SCAG-76 forecast the present population of the study area is approximately 38,400. Of this population it is estimated that within the Las Virgenes Municipal Water District there are approximately 27,900 and approximately 10,500 within the Triunfo County Sanitation District.

The population in the study area could generally be classifed as affluent, well-educated and predominantly white Anglo-American.

Median family incomes in this study area are significantly above those of other areas in either Ventura or Los Angeles Counties. (See Table 28.) The Triunfo area median family income of $19,009 is higher than most areas of Ventura County, except for Thousand Oaks. As a comparison, the median family income, according to 1970 census, for Ventura County is $11,162 and Los Angeles County is $14,703. From these figures it can be assumed that the study area families are generally affluent, earning a higher than average income, and that living costs are higher than average. Cost of living is no doubt a strong factor which controls the character of population migration into the study area.

Migration

Growth in the study area occurs by immigration, and the primary source of immigrants is the City of Los Angeles, as is indicated in Table 29.

Population Projections

Population projection is an inexact science and subject to considerable variation with change in interrelated factors such as birth rate, immigration, housing, employment, etc.. Other factors such as regional and local governmental policies can also affect the ability of an area to increase or decrease in population, and cause continuing revision in projections.

There are several agencies that provide population projections in the area covered by this EIS. The Southern California Association of Governments (SCAG) attempts to coordinate projects and policy according to adopted population projections for the region. The population projections which were adopted as policy by the SCAG Board of Directors in 1974 were referred to as D/E2a projections. The "D/E" referred to fertility and migration rates,

Table 28

INCOME, EDUCATION, RACIAL AND ETHNIC CHARACTERISTICS OF THE STUDY AREA POPULTATION 1/

	Las Virgenes MWD	Triunfo County Sanitation District
Median Family Income	$19,512	$19,009
% of Families with Income Below Poverty Level	3.3%	3.6%
Education (persons 25 yrs. or older)		
% high school graduates	86%	91%
% college graduates	29%	29%
Race & Ethnicity		
Negro	.6%	.4%
White, Spanish (surname or language)	4.4%	4.6%
White, other	95%	95%

1/LVMWD:L.A. - Long Beach SMSA; Census Tracts 8001, 8002, 8003.01 8003.02. TCSD: Oxnard-Ventura SMSA; Census Tracts 59.03, 74.

Source: 1970 Census

TABLE 29

RESIDENCE CHANGES 1/

1965-1970

Residence in 1965:

Different house (LVMWD)	
In City Of Los Angeles	6,206 (35%)
In Other Part of L.A. County	2,557 (15%)
Outside L.A. County	3,381 (19%)
Previous residences unreported	1,400 (8%)
Same house as in 1970	3,981 (23%)
Different house (TCSD)	
In Ventura County	107 (3%)
Outside Ventura County	2,734 (88%)
Previous residence unreported	156 (5%)
Same house as in 1970	116 (4%)

1/Source: 1970
Census

the "2" to a level of population distribution, and the "a" referred to employment and housing factors. However, due to recent downward changes in fertility, migration and growth policies, SCAG revised its previous population projections.[1]

In December of 1975, the SCAG Executive Committee adopted the revised growth projections. These new figures, referred to as the SCAG-76 Forecast, reflect the downward changes in fertility, migration and growth policies of the region.

Los Angeles County was preparing, at the time of the Draft EIS/EIR, a revised series of population projections comparable to the SCAG-76 projections. At this time, however, L.A. County has elected to utilize the SCAG-76 Forecast rather than develop an additional series of projections. Ventura County has prepared and adopted revised population projections comparable to the new SCAG projections.

The State Water Resources Control Board, due to the area being recognized as a critical air basin, will only authorize grant funds for sewerage system facilities in the South Coast Air Basin if the planning assumes a 10 year projection based on the E-O projections developed by SCAG. The E-O projections utilized a level of 2.1 births per woman and a zero net in-migration into the State.

The following graphs illustrate the currently adopted SCAG-76 and E-O projections for the study area as of December, 1975. Figures 44 and 45 should be consulted for the geographic sub-areas referred to in these charts.

Based on the SCAG-76 population figures, the portion of the study area under the jurisdiction of the Las Virgenes Municipal Water District had an estimated 1975 population of 27,900. The population is expected to increase in 1990 to approximately 43,000, an increase of 54 percent. By the year 2000, a 21 percent increase over the 1990 population is anticipated, which would bring the population count to 52,000.

The E-O growth projections for this same area are considerably lower than the SCAG-76 projections. The 1990 E-O projections estimate the population to be 32,100, a 15 percent increase from the 1975 estimate. This is 39 percent less than the SCAG-76 estimates. For the year 2000, the E-O series projections indicate a 10 percent increase over the 1990 estimate, bringing the total estimated population to 35,400. This 10 percent

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I. SCAG, Dennis Masyczek, Regional Planner

EIS/EIR
Las Virgenes-Triunfo
Malibu-Topanga
Area Wide Facilities Plan

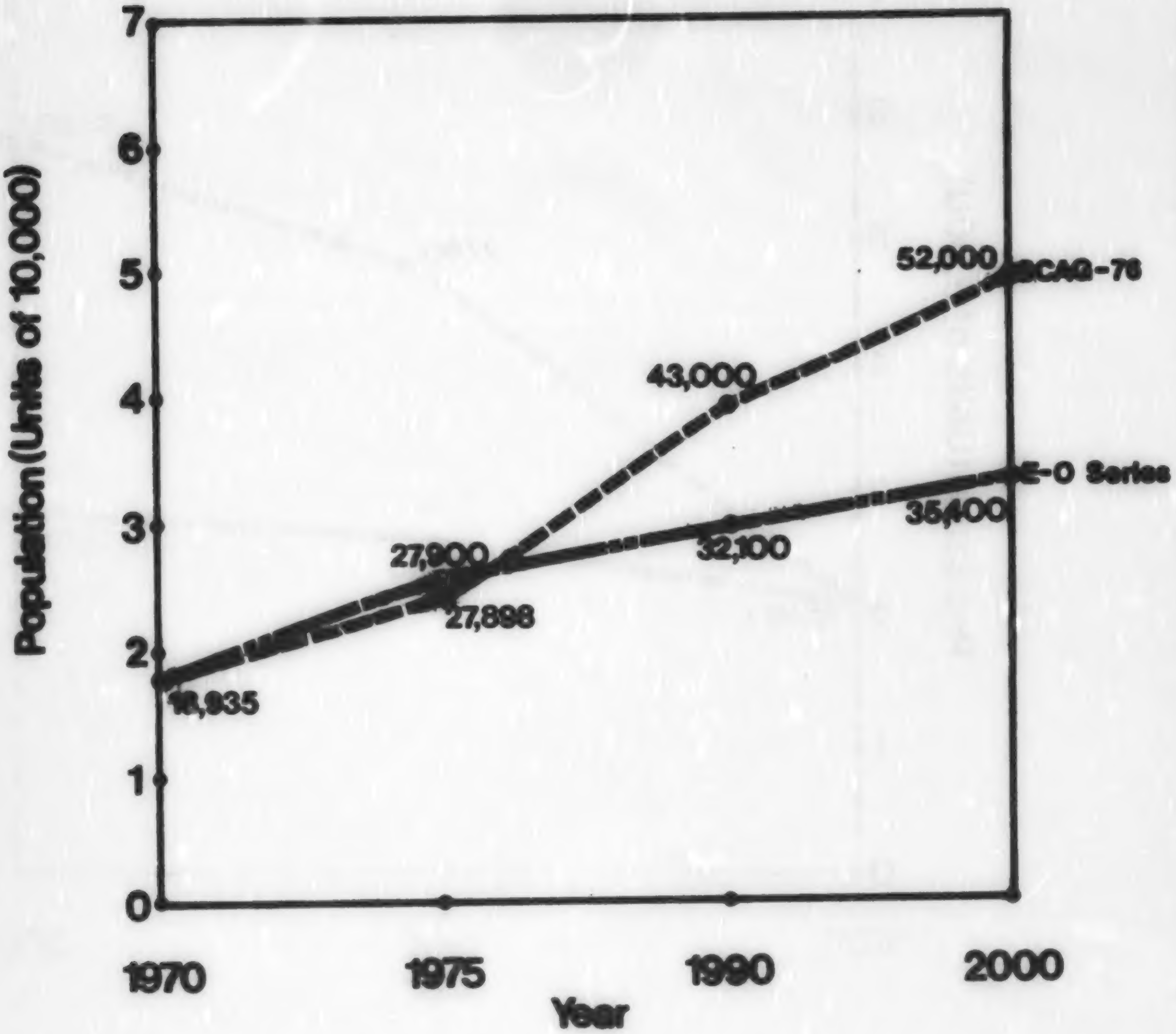
4
12
5
5
5
16
15
regional statistical area
7
census tract
key to inset
0
1000'
3000'
2000'
0
2000'
North
Scale

statistical areas

fig. 43

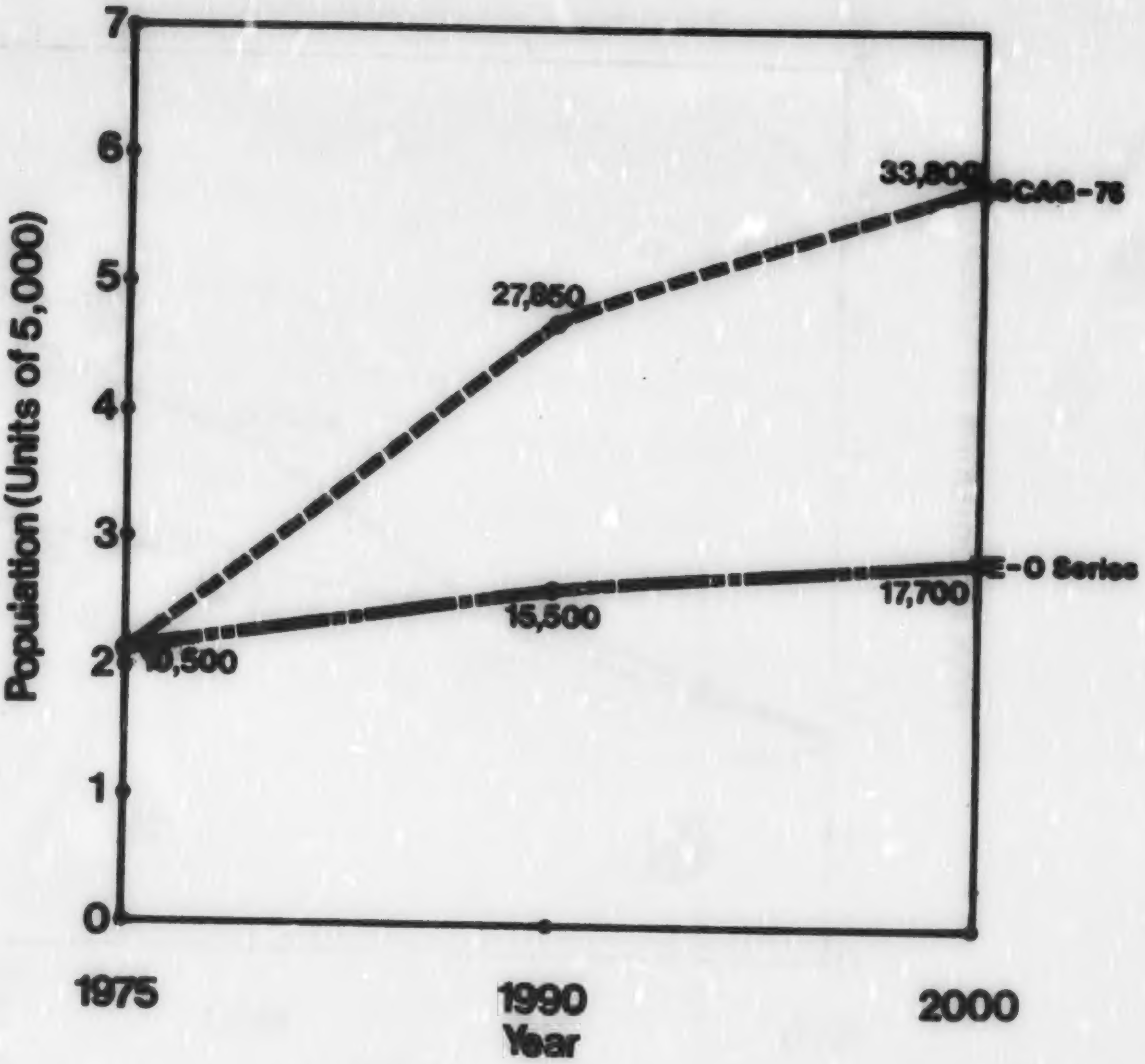
2-130-A

Figure 44



RSA 7
1970 - 2000
Population Projections
SCAG-76 Series and E-O Series

Figure 45



Portion RSA 5 in LVMWD
Service Area *
1975 - 2000
Population Projections
SCAG-76 Series and E--O Series

* CT 59.03, Portions of CT 73, 74, 75

increase is 50 percent lower than increases projected by SCAG.

In the Triunfo County Sanitation District portion of the study area, the 1975 population was estimated by SCAG to be 10,500. By 1990 the SCAG-76 forecast indicates an increase to 27,850, a 165 percent increase from the 1975 estimates. The 2,000 estimates indicate a 21 percent increase over the 1990 projections, bringing the population count to 33,800.[1]

The E-O growth projections for the TCSD area are, again, lower than the SCAG-76 series. In 1990 the E-O series only projects a 47 percent increase in population from 1975, bringing the 1990 population to 15,500. This is 118 percent less than the rate of increase projected by the SCAG-76 figures. Between 1990 and 2000 the E-0 series only projects a population increase of 2,200 persons, a 14 percent increase over the 1990 figures.

In summary, the 1975 population for the total study area was 38,400. The SCAG-76 growth policy forecast estimates indicate the 1990 population to be 70,850 and 85,800 for the year 2000. The E-0 series estimates indicate a 1990 population of 47,600 and a 2000 year population of 53,100. The 1990 E-0 population of 53,100. The 1990 E-O projections are 32 percent less than the SCAG-76 projections and 38 percent lower than the year 2000 figures.

It should be reemphasized here that determining population projections for small units such as portions of census tracts (as is the case for the jurisdictional area of the TCSD), as opposed to larger units such as RSA's or counties, can result in varying degrees of error. The validity of the estimates presented here is almost totally dependent on the development potential of the TSCD area. If little or no development occurs, the E-O series could be valid. However, if full development occurs in this area, the population indicated in the SCAG-76 series could be equalled or even exceeded.

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[1] SCAG, Dennis Masyczek, Regional Planner

2.3.3 Land-Use

Land use and the question of projected land-use in the Las Virgenes study area has stimulated probably one of the most ardent discussions taking place in the Los Angeles Metropolitan Region. Proposals for land use are widely divergent, ranging from large scale urban expansion to federal acquisition of the area as an "Urban National Park". The obvious value of the area, as one of the remaining large scale land resources, has begun to create a crisis atmosphere as the problems of providing needed open space and needed urban expansion meet head on in the Santa Monicas.

The definition and resolution of the issues are made no less complex by the shared responsibility for the planning and regulation of land use. The three major agencies directly involved in land use planning in the Las Virgenes area are the two county governments of Los Angeles and Ventura, and the city of Thousand Oaks. Less directly, but nonetheless influential in regulating land use is the South Coast Regional Commission of the California Coastal Zone Conservation Commission, and the Santa Monica Mountains Planning Commission.

The policies of each of these agencies, with regard to their future land use planning, will be discussed with the projected land use to 1990 in this section.

In order to put the projected land use in context, a survey of the existing land use should be first delineated.

Present Land Use

Of the study area's 145,926 acres, only about one-eighth contain some type of urban land use. The great majority of land is either natural or rural open space, with existing urban uses generally clustered around the Pacific Coast Highway and U. S. Highway 101. Commercial and industrial land uses are not substantial in the study area. The primary commercial function is urban supportive, while industry is limited to several hundred acres located primarily in the Thousand Oaks and Agoura areas. Residential use is by far the greatest urban land use in the area.

The extent of urbanization has been mapped and appears in Figure 48. In the Los Angeles County portion of the study area, there are no up to date land use maps available, therefore available maps were updated from aerial photographs of the region. Because of this, the categories of land use are generalized but more accurately depict the extent of urbanization rather than exact intensities of land use. The general categories used are as follows:

Urban High Density (UH)[1] This category defines those areas where further development of parcels would be difficult due to existing developed densities. In other words, given the occurrence of further urbanization of the study area, the development would most likely not occur in a UH zone because almost all of the available land has been improved. This designation fits certain commercial and institutional areas, as well as residential areas. No differentiation is made, however, between commercial and residential areas as development density is the determining criteria for the category.

Urban Low Density (UL)[1] This category shows essentially all urban lands not designated as UH. Included are urban uses which appear as non-contiguous developments (not a part of a subdivision), and other urban lands of sparse existing development. The basic premise is that these lands will receive further urbanization by reason of their ability to grow from within (increase in developed density), and because precedents for development have already been established.

Recreation(R). Recreation areas shown on the land use map include all existing public parks, either developed or undeveloped under jurisdiction of the State of California, the County of Los Angeles, the County of Ventura, and the City of Thousand Oaks. Also shown are public golf courses, public beaches, and some semi-private campgrounds and retreats. The designation includes lands to be included in the State Park system which have been funded for acquisition.

Open Space (O). This category of land use, irrespective of zoning, includes undeveloped land, agricultural land, scenic resources land, and land used for other nonurban uses (i.e., power transmission facilities, reservoirs and lakes, sanitary land fills, fire breaks, etc.). The open space resource of the project area may collectively be the most significant in any large urbanized region in the nation.

Housing

In 1970, there were approximately 11,600 housing units in the study area. Malibu was the only subarea to have seasonal housing, and it also had the highest percentage (nearly 30 percent) of renter occupied units. Occupancy characteristics of study area housing are summarized in Table 30.

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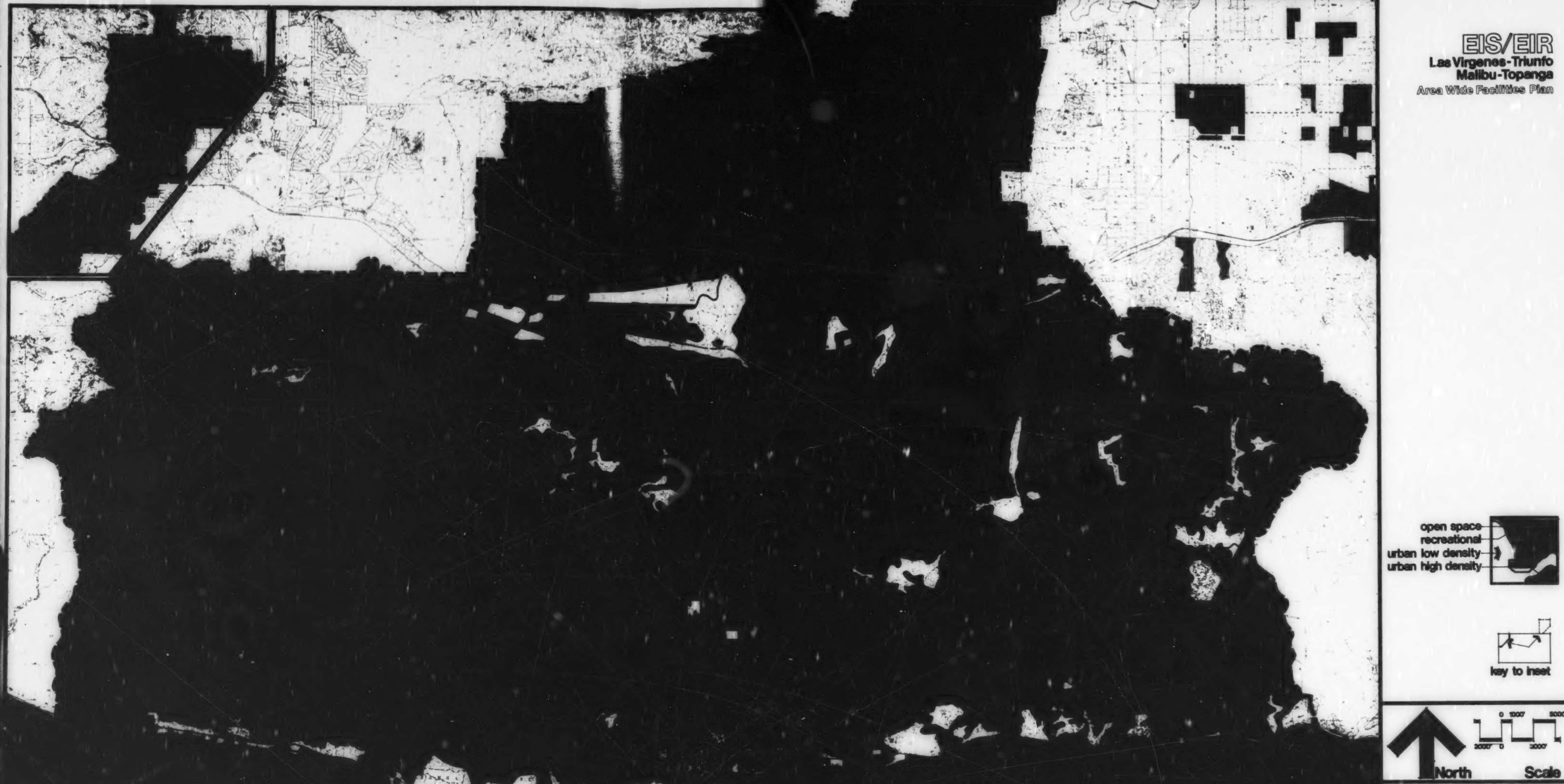
[1] Terminology utilized by Boyle Engineering in Draft AWFP, and used here for consistency.

Table 30

STUDY AREA HOUSING STOCK
OCCUPANCY CHARACTERISTICS
1970

Area	Total Housing Units	Vacant Seasonal Housing	Owner Occupied Units	Renter Occupied Units	Persons per DU (Owner)	Persons per DU (Renter)
Triunfo	1,224	--	987	108	3.9	3.2
Calabasas	5,838	--	4,514	948	3.2	2.3

Source: Bureau of Census, Occupancy, Utilization and Financial characteristics of Housing Units: 1970.


open space
recreational
urban low density
urban high density
key to inset
North
Scale
0
1000'
5000'
2000'
0
3000'

EIS/EIR

Las Virgenes-Triunfo
Malibu-Topanga
Area Wide Facilities Plan

land use -existing

fig.48

2-136-A

The study area has an understandably high valued housing stock. Probably the most significant factor affecting housing cost is land value. High median family income is an additional indication of high housing value in the study area.

Age of housing probably plays an inconsistent role in establishing the value of the existing housing. For instance, Malibu has the highest number of pre-1960 housing units, but also has the highest median housing value. Las Virgenes and Triunfo have had most of their housing constructed since 1960, an increase of 228% and 500% respectively, yet the median values are lower than Topanga or Malibu. Age of housing probably has no negative effect on housing in an area such as Malibu. In fact, the value may be enhanced. The age and value characteristics of the study area housing stock are contained in Table 31.

Land Values

Land value is an important but fluctuating factor in the study area. The value of land changes almost daily due to a variety of circumstances and events. Many of the events which help establish land value are themselves unpredictable.

Over as broad a region as the study area, there are wide fluctuations in land value. The Malibu area probably has the most unpredictable, and the highest values. Prices start at about $2,000 per foot of beach frontage ($100,000 per acre), and generally decrease with distance from the ocean. A lot on a hill with a view certainly has a higher value than the lot only 150 feet away, but on the back side of a canyon with no view. Real estate people tend to shy away from making this type of generalization about the Malibu area.

One aspect which has had a known effect on land values in the coatal area is Proposition 20 and the Coastal Commission. The Coastal Commission has noted a rise in the value of land already developed with housing. Undeveloped land of five acres or more has shown a decline in value from 10 to 18 percent. This is probably due to the decreased development opportunity created by the coastal permit procedures.

Land values in the interior mountain areas are naturally lower than those of the coastal area and tend to fluctuate less. Some of the land in the mountains is valued as low as

Table 34

STUDY AREA HOUSING STOCK
AGE AND VALUE

Area	1970 Median Value	Number Constructed Prior to 1960	Number Constructed After 1960
Triunfo	$36,200	200	1,000
Las Virgenes	42,500	1,800	4,100
Malibu	50,000+	2,500	2,000
Topanga	50,000+	1,432	669

Source: Bureau of Census: Occupancy, Utilization and Financial Characteristics of Housing Units: 1970, rounded off.

$300 to $500 per acre. Other mountain land with more development potential and some improvements such as water, power or roads, ranges from $1000 to $3000 per acre. Essentially flat land in the Las Virgenes Valley has recently sold for from $3000 to $6000 per acre. Highly developable land with access to utilities or transportation can cost from $5000 to $15,000 per acre. This brings up an important factor of the system: land value is based on development potential. The more improvements that are made to land, the higher its value. Even development of adjacent land can increase the value of a parcel (and taxes), and therefore increase the incentives for development.

The degree of government involvement in planning has affected land values in the interior portion of the study area similar to the way the coastal commission has affected land values along the coast. The fact that county, state and other special land-use planning studies have called for increased park and open space acreages and decreased urban expansion has affected the speculation of land dealings, thereby tending to lower values of undeveloped land.

Projected Land Use to 1990

Los Angeles County. The Environmental Development Guide (EDG) of 1970[1] set down the basic policies and projections for the 1970-1990 urban development policy for Los Angeles County. The Guide outlines the areas of urban expansion, open space, and the existing urban pattern including areas for continued maintenance or recycling. Figure 46 illustrates the policy as described in the EDG. From this illustration it may be seen that much of the planned urban expansion will occur along the Highway 101 corridor.

In June, 1973 the Los Angeles County Board of Supervisors adopted The 1973 County General Plan. The land-use element of this plan was to define in more detail the county's most up to date land-use policies through 1990. A comparison of the EDG urban development policy and the adopted General Plan Land-Use Map revealed a noticeable discrepancy in the extent of urban expansion, particularly in the Las Virgenes Valley and the Malibu Lake - Medea Creek areas.

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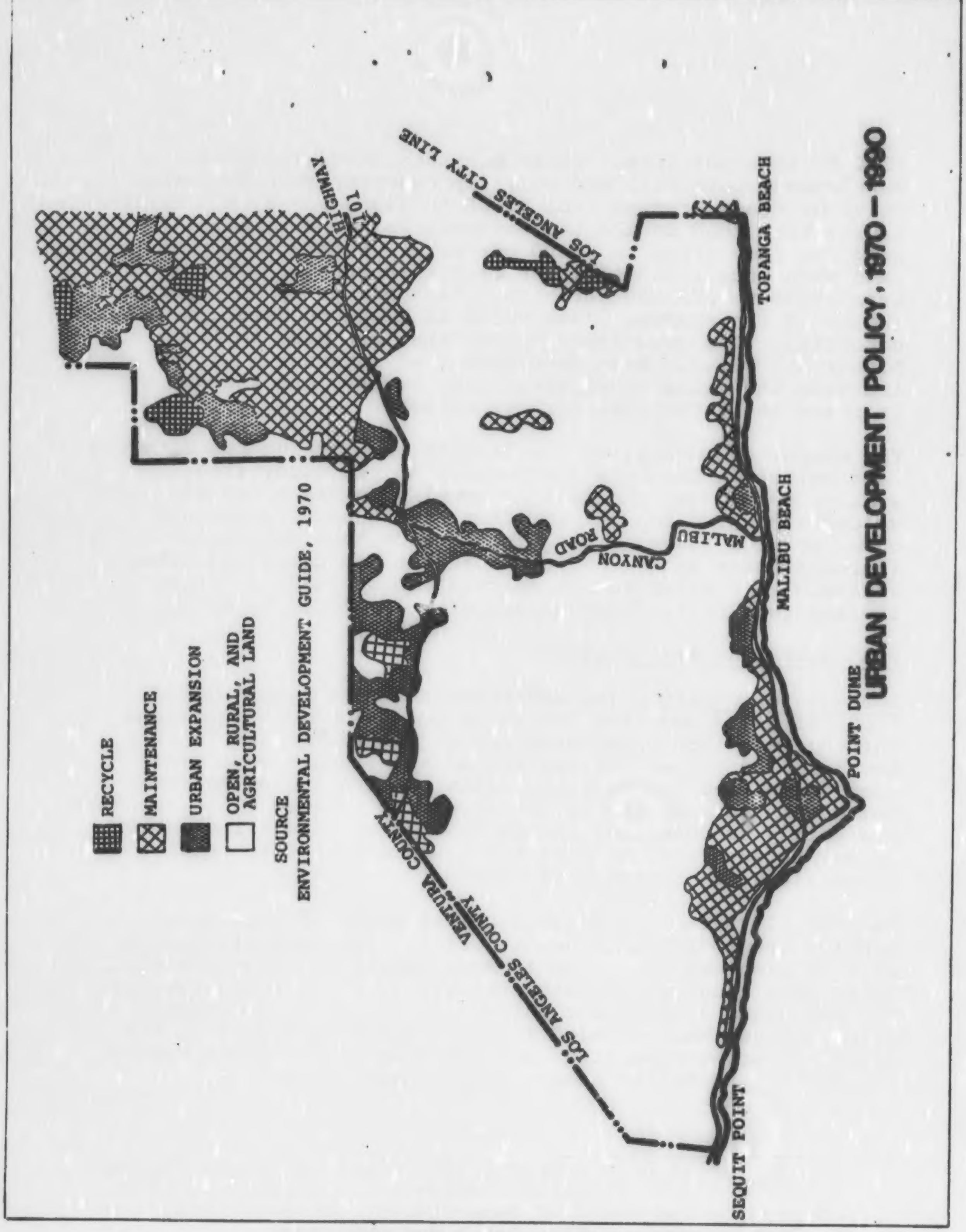
1. Environmental Development Guide, Approved by Los Angeles County Regional Planning Commission, September 1, 1970, Adopted by the Board of Supervisors, October, 1970, Published July 1, 1971, Print date February, 1972


URBAN DEVELOPMENT POLICY, 1970—1990
RECYCLE
MAINTENANCE
URBAN EXPANSION
OPEN, RURAL, AND AGRICULTURAL LAND
SOURCE
ENVIRONMENTAL DEVELOPMENT GUIDE, 1970
HIGHWAY 101
LOS ANGELES CITY LINE
TOPANGA BEACH
MALIBU CANYON ROAD
MALIBU BEACH
POINT DUME
LOS ANGELES COUNTY
VENTURA COUNTY
SEQUIT POINT

1970-1990 Urban Development Policy, EDG
Los Angeles County
Figure 46

Partially because of these inconsistencies between the EDG and the General Plan, a suit was filed against the County by a coalition of the Sierra Club, Malibu Township Council, Inc., Palos Verdes Coast Watch, Robert Heredia, Margot Feuer, Leslie Fox, and the Coalition for Los Angeles County Planning in the Public Interest. In July, 1975, an injunction was filed by Judge David A. Thomas of the Superior Court of California for Los Angeles County. The effect of this decision states that all areas classified as urban or urban expansion in the 1970 EDG are not affected by the decision and are still within the policies of the 1973 General Plan. All other areas of the County not classified in the EDG as urban or urban expansion are currently under injunction and the 1973 General Plan is void. In these areas, the 1970 EDG is to be used as the basis for development policy.

In the Open Space Concept portion of the EDG, which was to be the organizing principle for the County's open space plan, most of the study area has been called out as conservation area. These areas were those lands of inherent scenic or open space value, natural resource and watershed areas, or areas of environmental hazard. Because of this injunction the land use plan, as shown on Figure 49, will certainly change in order to bring the General Plan into accordance with the guidelines set down in the EDG. The data shown as to projected growth in the study area were taken from the General Plan and are therefore also subject to revision at the time when the General Plan is adopted.

To evaluate land uses in the new General Plan, the County has utilized a computer process that identifies elements such as seismic zones, vegetation, agricultural lands, fire zones, slope stability, land use, flood prone areas, and significant ecological area (SEA) on a 10-acre grid cell and then overlays these elements to produce a composite map that identifies areas that are suitable for development according to six different environmental constraints values. Additionally, development suitability classes of moderate, major and severe were developed. They include land over 30 percent slope, areas subject to seismic shaking or rupture, areas subject to landslides, flood prone areas, and SEA's or areas buffering the significant ecological areas.

A large portion of the study area could fall into the above categories, hence development in the study area is expected to be somewhat restricted. However, the above definitions of the categories of the development suitability classes could be refined or changed prior to adoption. The results of this complete process to determine developable areas will be subject to adoption by the Board before development policies and guidelines are finalized.

TABLE 32

1990 PROJECTED LAND USE ACREAGES

TRIUNFO CSD

Land Use Class	Triunfo Acreage
Urban Residential	3,620
Commercial	240
General Industrial	380
Open Space	16,700

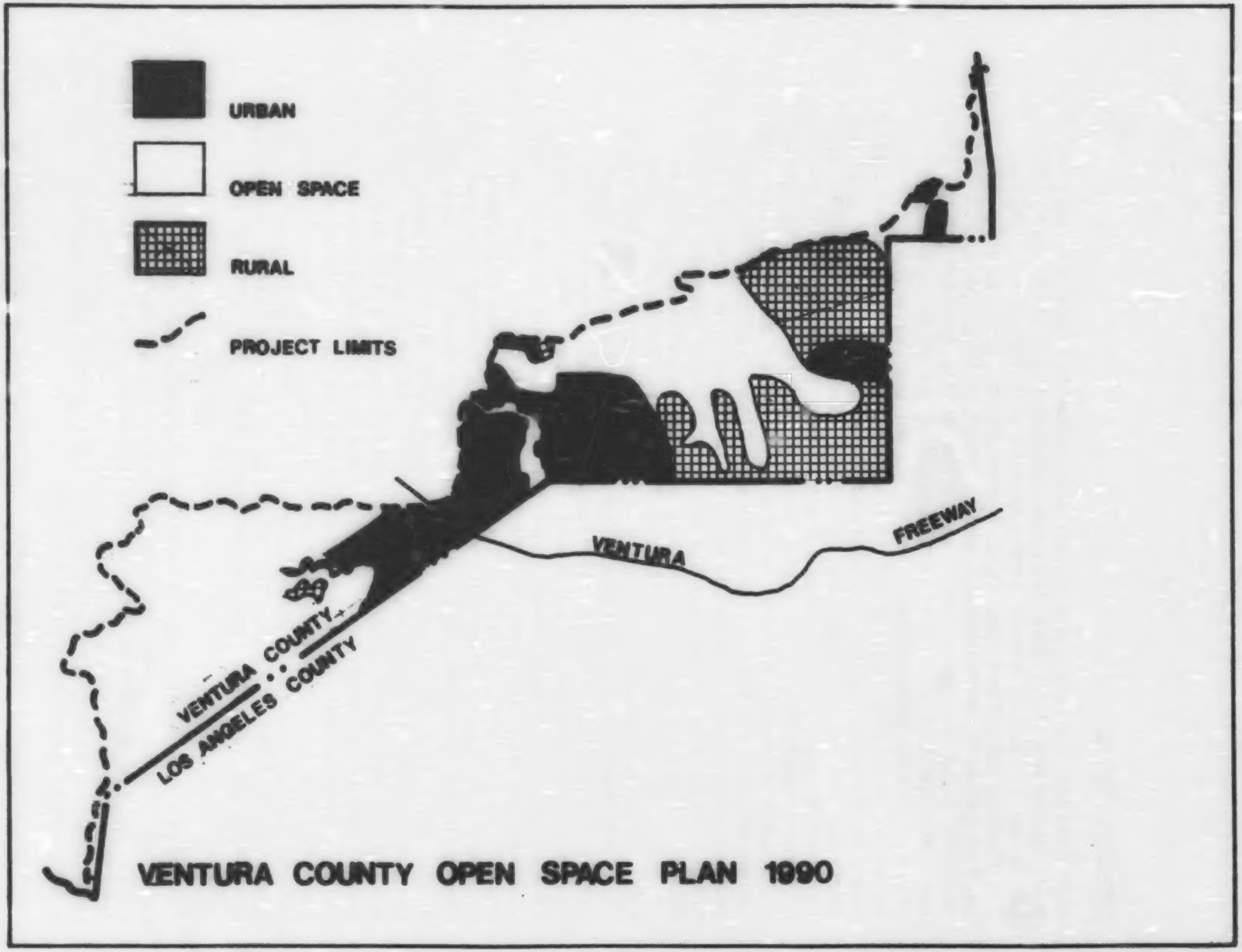
Source: VCAG 1974 Transportation Study
Thousand Oaks Development Plan
All figures represent gross estimates

Ventura County

The Ventura County Open Space and Conservation Element of the Resources Plan and Program, adopted in 1973, provides policies by which urban development can occur to 1990. The County utilizes the Open Space Plan, (see Figure 47) as the general development guide when making decisions regarding land use changes. The Plan shows the majority of the land in the study area classified as open space or rural. Urban development is shown as occurring adjacent to or within the sphere of influence of incorporated cities, such as Thousand Oaks. Thousand Oaks projects a 77 percent increase in total land use by 1990. In fact, by 1990, the City of Thousand Oaks could rank first in total acreage of urban land use in Ventura County. This projected growth will have a major effect on the area as it merges with the urban expansion along the Highway 101 corridor. The projected growth will have a major effect on the area as it merges with the urban expansion along the Highway 101 corridor. The projected acreages of the various categories of land use in Triunfo CSD are listed in Table 32. This data is also mapped in Figure 49. It should be noted here that two recent residential development plans have been granted approval within the jurisdictional area of TCSD which could hasten development in the area. The Oak Park development at Kanan Road just outside of Los Angeles County and within Ventura County had a zone change approved as a result of a court order. This resulted in an amendment to the Open Space Element of the Ventura County General Plan. The planned area encompasses 2,665 acres that will include 5,913 dwelling units to be developed over an estimated 17 year period ending in approximately 1990. Of this number, 841 units are to be detached single family dwellings, 4,472 are to be medium density clustered single family dwellings, and 600 are to be apartments. The area presently is being developed to accommodate a previously planned conventional neighborhood of 600 detached single family dwellings. The total projected population in 1990 for the Oak Park area is estimated to be approximately 15,530. The existing (1977) population is 2,294.

The North Ranch planned development is in the northeastern portion of Thousand Oaks in the vicinity of Lindero Canyon. Specific Plan No. 4 (North Ranch) has recently been approved by the City of Thousand Oaks and the County of Ventura. This plan contemplates a total of 6,600 units in the Triunfo service area with a projected population of 17,000.

Townhouses, condominiums, apartments	- 5,000 dwelling units
Single family homes on minimum 1/4 acre lots	- 1,600 dwelling units
TOTAL	6,600 dwelling units


URBAN
OPEN SPACE
RURAL
PROJECT LIMITS
VENTURA FREEWAY
VENTURA COUNTY
LOS ANGELES COUNTY
VENTURA COUNTY OPEN SPACE PLAN 1990

Ventura County Open Space Plan-1990
Figure 47

EIS/EIR
Las Virgenes-Triunfo
Malibu-Topanga
Area Wide Facilities Plan

industrial
open space
commercial
urban residential
key to inset
0
1000'
5000'
2000'
0
3000'
North
Scale

land use -1990

fig.49

2-144-A

The North Ranch development will have sewerage service in the western half from the City of Thousand Oaks whereas the eastern half will be serviced by the TCSD. Oak Park will tie into the TCSD sewerage system.

In addition to the projected population for Oak Park and North Ranch, the Westlake and Bell Canyon areas will contribute additional population to the Triunfo service area as follows:

Westlake

2,806 lots have been approved for the Westlake Village area with 1,768 lots presently improved, leaving 1,038 yet to be connected. It is estimated that these lots will produce a population of about 4,300 in addition to the existing population of 9,754 for this area.

Bell Canyon

This development has a total of 666 residential lots with 598 remaining to be improved. When fully developed, this area is expected to contribute a total population of 2,530 to the Triunfo service area.

2.3.4 Open Space, Parks and Recreation

Due to its quality and proximity to a major urban center, the study area is a unique natural resource important to the needs of open space and recreation of the Los Angeles metropolitan region. With current rates of urbanization, it is fast becoming a scarce resource. The Santa Monica Mountains represent one of the last vestiges of natural scenery, rugged topography, open space and wildlife in one of the nation's major population centers.

Opinion is divided as to what form open space will take as development of the area increases. Conservation groups advocate a greater increase in publicly-owned parkland and more stringent land-use policies to protect open space for both its recreation and conservation purposes. On the other hand, proponents of further urban development argue that the mountains' complex topography and geology would prevent overdevelopment. The future land-use pattern is difficult to ascertain, but there is a high probability that public acquisition of open space for recreation and conservation will increase.

The abundance of available land and its proximity to Los Angeles make the Santa Monicas a prime source for land needed to alleviate the region's parkland deficiency, particularly in terms of regional facilities[1]. By the standards adopted by the Los Angeles Regional Planning Commission, four acres of local and community parks should be available for every 1,000 persons, or a total of 28,128 acres within Los Angeles County. Los Angeles County provides a total of 7,096 acres. By these same standards, six acres of regional parks should be available for every thousand persons, or a total of 42,192 acres for Los Angeles County. Los Angeles County presently provides 41,071 acres. Given current population projections for a 1990 population of 7.7 million persons, the Regional Planning Commission estimates the deficiency will increase to 4,454 acres for local parks, and 5,029 acres for regional parks. This rise in demand will be for what the State Department of Parks and Recreation defines as Class 2 land: i.e., recreation land within 40 minutes' driving time for day use. Well over half of the study area is so classified.

Existing Open Space

The definition of open space varies widely, and often includes low-density residential and agricultural lands. California Planning and Zoning Law defines it as follows:

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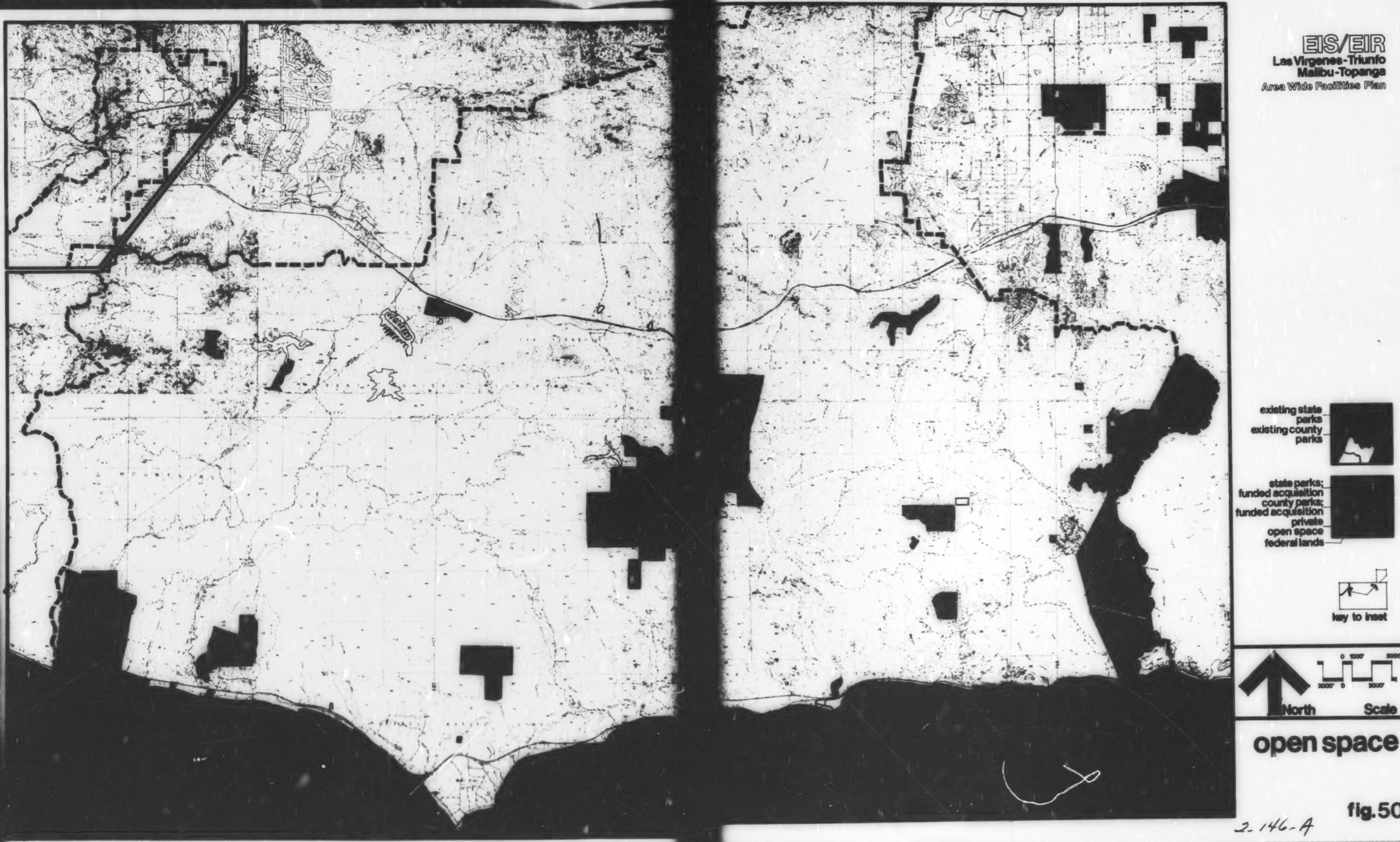
[1] Ventura-Los Angeles Mountain and Coastal Study Commission Planning Study, EDAW, Inc., 1972

EIS/EIR
Las Virgenes-Triunfo
Malibu-Topanga
Area Wide Facilities Plan


existing state parks
existing county parks
state parks; funded acquisition
county parks; funded acquisition
private open space
federal lands
key to inset
0
1000'
3000'
2000'
0
2000'
North
Scale

open space

fig.50

2-146-A

TABLE 33

SELECTED OUTDOOR RECREATION FACILITIES
COUNTY OF LOS ANGELES, 1972

(from Los Angeles County General Plan, pp. 50)

TYPE	SIZE	EXISTING #	COUNTY STANDARDS	PRESENT REQUIREMENTS	PRESENT DEFICIENCY	1990* REQUIREMENTS	DEFICIENCY TO 1990
LOCAL PARK	1-49 acres	655	4 acres/ 1000 persons	28,128	21,032	30,800	4,454
SCHOOL PLAYGROUND	size varies	1,454	2 1/2 acres 1000 persons	17,580	8,778	19,250	10,448
REGIONAL PARKS	50 acres & over	86	6 acres/ 1000 persons	42,192	1,021	46,200	5,029
BEACHES	Size varies	20	all available beach frontage				

* Presumes a population increase to 7.7 million and no change in County standards.

> "Open-space land" is any parcel or area of land or water which is essentially unimproved and devoted to an open space use, and which is designated on a local, regional or state open space plan for the preservation of natural resources, for the managed production of resources, for outdoor recreation or for public health and safety."

By this definition, some 93% of the study area qualifies as open space, since only the inland valley and coastal portions contain development with a density of more than 1 dwelling unit per acre. In this section, the term "open space" shall include publicly-owned open lands, such as parks; lands currently in the process of public acquisition; land being transferred from a publicly held use to an open designation, such as Nike sites, and private lands specifically held as open space, such as wildlife preserves. Within the study area, agencies currently involved with maintenance and preservation of open space include: county, state, and federal governments; a park district; and private trusts. Local, county, and state governments possess a total of 6,534 acres of parks and beaches in the study area. The Bureau of Land Management is the custodian of 398 acres; while the U. S. Army has two Nike Missle sites totalling approximately 138 acres. An additional 450 acres are privately held by land trust funds and research foundations. There are also two large state parks just outside of the project boundaries: Point Mugu State Park to the west contains 13,360 acres; and Topanga Canyon State Park to the east contains 9,870 acres.

Local and Community Parks

Local and community parks are defined by Los Angeles County as parks less than 50 acres. Within the study area, there are ten such parks, totaling 128 acres (listed in Table 34). Four parks totaling 25 acres are maintained by Los Angeles County to serve the Las Virgenes area and one park of six acres to serve the Malibu area. By the B.O.R. minimum standards accepted by Los Angeles County, the Las Virgenes area presently should have a minimum of 108 acres of local and community parks based on a population estimate of 27,000. Within the Ventura County portion of the study area, there are five local or community parks within the study area. These are maintained by Conejo Recreation and Park District for the community of Thousand Oaks and the Simi Valley Park and Recreation District. Portions of these parks in the

TABLE 34

COMMUNITY AND NEIGHBORHOOD PARKS

LOS ANGELES COUNTY

Name	Acreage	Type Facilities
Reyes County Park	4	Neighborhood
Gaton Place County Park	6	Neighborhood
Agoura 1 County Park	3	Neighborhood,Active Recreation
Agoura 2 County Park	12	Neighborhood, Active Recreation
Grape Arbor County Park	5	Roadside Rest
TOTAL	30	

VENTURA COUNTY

Name	Acreage	Type Facilities
Mae Boyar Park	6	Community
Triunfo Canyon Park	30	Undeveloped
Tract 1967-1	4	Outdoor Grills, Picnic, Play Area
North Ranch 1	13	Undeveloped
North Ranch 2	5	Undeveloped
Total	98	

TABLE 35

REGIONAL PARKS

LOS ANGELES COUNTY

Name	Acreage	Type Facilities
Chamlee Ranch County Park	460	Proposed picnic, camping, and nature study
Zuma Canyon County Park	95	Undeveloped
Zuma Beach County Park	105	Beach Day Use
Tapia County Park	110	Camping, picnic, sports & equestrian
Ramirez Canyon County Park	435	Undeveloped
Nicholas Canyon Beach	24	Beach Use
Total	1,209	

VENTURA COUNTY

Name	Acreage	Activity
Lake Eleanor Regional Park	486	Hiking, Viewpoint, fishing
Oakbrook Regional Park	464	Hiking, Viewpoint
Total	950	

study area total approximately 98 acres. Ventura County has adopted a ratio of seven acres of community parkland per thousand persons, thus the present population within the Triunfo County Sanitation District area would require 675 acres based on a present population estimate if 9500.

Additional acreage acquisition by Los Angeles County or Conejo Recreation and Park District is not planned for the immediate future. Simi Parks and Recreation District has plans for a 50+ acre community park in Oak Park, and approximately 10-4 acre parks in the same development to be constructed in the future.

Regional Parks

Regional parks are defined as containing 50 acres or more designed to offer recreational opportunities to a broad spectrum of users and include beaches.

There are eight such parks in the study area. Six are maintained by Los Angeles County and two are maintained by Ventura County. Of the two Ventura County parks, only portions of Lake Eleanor Regional Park are within the study area. The total regional park acreage within the study area is 2,159 acres, as described in Table 35. Additions to county regional parks are not planned for the immediate future; plans for acquisition are focused on beaches.

State Parks

The California Department of Parks and Recreation currently has more than 5,500 acres of parkland in the study area. The new Malibu Creek State Park is the largest park, with 3,875 acres available for day use, hiking and outdoor recreation. Additional land that may be added to the park in the future is the 214-acre Claretville Farm (Claretian Seminary), and a portion of the Sampo-Hope Ranch which is located north of Mulholland Highway and east of Las Virgenes Road. Claretville Farm has been approved for acquisition in the States 1977-78 Budget, and negotiations are currently underway to purchase the farm. If the State does acquire the land, the tenative plans are: overnight use in the existing buildings, possible camping areas, and an environmental study area. The State also has plans to acquire the lower southeast corner (90 acres) of the Sampo-Hope property to add to the view shed of the Malibu Creek State Park. With this additional acreage, the park could total 4,179 acres, bringing the total State owned parkland in the study area to 6,082 acres.

TABLE 36

INVENTORY OF EXISTING STATE PARKS AND BEACH LANDS IN PROJECT AREA

Name	Acreage	Miles of Oceanfront	Visitor Use 1971	Designated Use
Leo Carillo State Beach Park	1,578	1.5	845,740	Beach Use, Camping
Point Dume State Beach	31	.8	503,380	Beach Use
Corral Beach	4	.7	353,905	Beach Use
Malibu Lagoon State Beach	50	.5	876,696	Marine Preserve
Las Tunas State Beach	2	.3	61,265	Beach Use
Malibu Creek State Park	3,875		N/A	Scenic, hiking, day use
Topanga Canyon State Beach	38	1.1	N/A	Beach Use
Total	5,578	4.9		

Federally Held Open Space

Although the federal government maintains no national parks in the area, two agencies -- Bureau of Land Management and the U.S. Army -- are the custodians of 536 acres available to state, county or local agencies as parkland. The California Department of Parks and Recreation has applied for the BLM site --398 acres at the mouth of the Ramirez Canyon. The County Department has applied for the 125+ acre site atop Saddle Peak; no applications are being received on the third site.

In May, 1977, Congressman Anthony Beilenson (D-Los Angeles) introduced legislation in Congress to establish the Channel Islands and Santa Monica Mountains as a national park and seashore. One hundred million dollars would be appropriated to purchase approximately 40,000 acres or to acquire easements, development rights, or other interests to lands and waters in the mountians. Fifty million dollars would be appropriated for lands not currently part of the Channel Island National Monument.

The bill is currently being reviewed by the House Interior and Insular Affaires Committee's National Parks and Recreation subcommittee. Congressman Beilenson indicates that "Placing the Channel Islands and the Santa Monica Mountains in the National Park system will not only conserve ecosystems of scientific, historic, and archeologic important, but will also provide high quality recreational land for more than 10 million residents of the Los Angeles metropolitan area and 8 million visitors annually."

Private Open Space

The Murphy Preserve, now owned by the Nature Conservancy, contains 450 acres to be left in perpetuity in a primitive undeveloped state. This preserve has been acquired to protect natural habitat type. (See Open Space Map, Figure 50.) This site contains some of the best examples of riparian woodland in the study area.

2.3.5 Historic, Archaeologic, Paleontologic Resources

The study area and surrounding Santa Monica Mountains provide a large amount of data to reconstruct California's history. There exists a great deal of evidence regarding several millennia of human settlement predating Hispanic occupation. Many research projects in the study have shown that there are many examples of prehistoric human settlements dating back as far as 5,000 B.C. Some evidence suggests that further archaeological research may yield proof of even earlier human settlement. That nothing else remains of man's prehistory in the area but the archaeological resources underscores the role of the various sites within the study area as the sole source of knowledge for these eras.

California's written history is also enriched by the area's historical resources concerning Spanish explorers, eventual colonization, and the area's more recent and colorful history when the coastal portion was a private estate.

The rate of destruction of California's archaeological resources makes this area important. The State Archaeological, Historical, and Paleontological Task Force notes that annually the State of California loses an estimated 1400 archaeological sites, 200 historic places, and an undetermined number of Indian cemeteries and paleontological sites to urbanization. Within the study area, only ten percent of the area has been surveyed, yet in an archaeological survey, conducted by U.C.L.A., 173 major sites in the study area were listed. While the area is far from being completely surveyed, these recorded sites represent a more complete assemblage of archaeological resources for all time periods than any other region of the California coast.

Archaeology

The risk of further loss by "grave robbing" and the professional reluctance to rank the importance of each site precludes mapping specific locations. Areas where archaeological sites are most likely to occur have been generalized and are contained herein. The public is often too eager to see the sites and take souvenirs, so the confidentiality of site locations must be maintained to protect them.

For the purpose of assessing the impact of future projects upon archaeological sites, known site locations and other pertinent data are available through the ongoing university research projects in the area (listed in the bibliography). Archaeologists of these research efforts should be consulted for each individual project.

Within the study area, it is likely that land where archaeological sites may be found coincides with land either presently developed or under pressure for imminent development. These are generally those lands of lower slope gradient and include the coastal areas and inland valleys such as Russell, Owens, and Simi. These were once occupied by hunter/ gatherers during the Millingstone Period (6000 B.C. to 1800 B.C.). Later tribes, such as the Chumash and Gabrielinos Indians, as their societies developed, also settled some of the inland canyons and mountain areas.

Since only ten percent of the area has been surveyed, it is hard to determine the extent of archaeological resources lost from existing development. Some of the more important sites thus far uncovered have been previously damaged such as the Chumash Indian Village site at Malibu Lagoon, which has been bisected by the Coast Highway.

Data collected thus far show that the area contains examples from each of the major time periods, called "horizons". These include: Early Man; Millingstone Cultures; Intermediate Cultures; and Late Prehistoric Cultures. It is known that man occupied the coast as early as 15-20,000 years ago. In the study area some evidence suggests human settlement occurred during the first horizon, but definitive evidence places the beginning of permanent settlements around 5500 B.C. during the Millingstone Culture. This was the final stop of a coastal migration over several thousand years in search of suitable environments. The first settlement groups consisted of hunter/gatherers, dependent upon searching out pleistocene era plant communities to provide vegetable protein rather than cultivation. During dry seasons hunting supplemented their diet.

The Santa Monica Mountains were suitable environment for this type of subsistence system. The existing riparian communities provided much of the nuts and berries gathered, as well as the larger game. The coastal sage-scrub probably provided berries and smaller game. This culture is believed to have existed approximately between 6000 B.C. and 1800 B.C. It should be noted that these time distinctions are not arbitrary, but are used to identify the likely time of significant change in subsistence systems.

For the first 4,000 years, these settlements remained relatively unchanged. Villages were small, and were not located along the coastal areas. These were usually found at major canyons, where abundant fresh water could be found. Villages later began to change in complexity by utilizing a greater range of resources. Trade between inland villages, coastal villages, and even with villages on offshore islands developed. Villages began to be founded according to specialized activity. Thus, in the mountains, "seed-processing villages" have been uncovered while near the beaches and along the major streams, villages for agricultural purposes developed.

This resource expansion also included greater dependency upon animal protein for more of the diet. More plant communities began to be utilized for subsistence, especially aquatic habitats, both fresh water and inshore marine. This became characteristic of later groups which developed complex subsistence systems, based upon the marine environment. More artifacts have been uncovered from this period than others.

The Chumash tribe emerged as a distinct group in the late Millingstone Period and over centuries developed complex social and subsistence systems until Hispanic diseases and colonization eliminated their culture. They, like many other such groups, were not so much a single tribe, but several tribes --or subgroups -- based on linguistic similarities. Social differences among these groups were based upon local conditions, especially type of subsistence activity. In general, the Chumash were characterized by an extensive trade network, a highly complex social structure, and a high degree of diversity in subsistence activity.

They were known for their fast, ocean-going plankless canoe, which facilitated extensive trade, especially with the Gabrielinos to the south. They also devised forms of aquaculture, utilizing schooling-fish, sea mammals, and kelp-harvesting, which is unique among California tribes.

The Hispanic exploration and colonization brought the demise and eventual extinction of the Chumash. European diseases were ruinous for the tribe and the few remaining survivors were forced to join the Fernandine Indians inland at the San Fernando mission.

Historical Sites

Currently, there are no historical sites listed with the State Historical Resources Commission on the National Registry of Historical Sites. Application is being prepared for the Chumash Indian site along Malibu Lagoon, which includes a 13-acre site at Vaquero Point with a large beach estate house designed by Stiles Clement, designer of the Hearst Castle. This site has been acquired by the State of California.

The Reyes Adobe, located one-mile north of Lake Lindero, is listed in The Historical American Building Survey, of The American Institute of Architects. (IHBS - Cal 329.) The small adobe structure is the original ranch house for the Rancho Las Virgenes, an estate that included much of the Russell and Owen Valleys.

Another unregistered point of historical interest is Serra Retreat on Landamus Hill near the mouth of Malibu Creek. It was the unfinished 40 room mansion of Mrs. Mary K. Rindge, owner of the 14,000+ acre Rancho Malibu Topanga Seguit, popularly known as "Queen of the Malibu". During bankruptcy proceedings, the Franciscan Order bought the estate for $50,000 a tenth of its construction costs. However, a major fire in 1970 destroyed the structure.

Paleontological Sites

Paleontological resources in the study area have been identified by consulting with the museum of Natural History in Los Angeles, and through information presented by the California Natural Areas Coordinating Council.

Paleontology is a science through which man studies fossils and fossilized materials and hence the remains of life (both plant and animal) from past ages. Fossilized remains are generally found in sedimentary rocks and in areas that have been tilted, unlifted or subjected to some other type of earth movement. Within the Santa Monica Mountains, sites have been found with contained vertebrate and invertebrate fossils.

Fossil sites are generally discovered through field research of amateur and professional paleontologists', or as a result of construction projects of roadways, housing sites, dams, etc., which reveal fossilized materials. When a contractor finds a fossil, it is hoped that he will call a locally recognized repository institution (normally a museum or University) to plan for a scientific salvage crew to collect the fossil(s) and inspect the construction site. A paleontologic crew will not necessarily hold up construction of a site, unless the find is highly significant. Normally, the salvage crew will simply collect the specimens, and return to the lab to determine the detailed factual data on the anatomy, classification and stratiographic distribution of the fossil.

Six vertebrate paleontological sites scattered throughout the study area have been identified. The following descriptions identify the site, location and the find.

1. Located on Old Topanga Road, south of Calabasas, a small marine bird, Puffinus, or shear water bird, was found in the Modelo Formation, Upper Member.

2. Located to the west of Las Virgenes Canyon, north of the Los Angeles-Ventura County line, is the type locality of the Cormorant, a coastal aquatic bird.

3. Located southwest of the Ventura Freeway and east of the Westlake Blvd., a ground sloth and possible other vertebrates were found, from the recent Pleistocene epoch.

4. Located northwest of the Los Angeles-Ventura County line near the intersection of Carlisle Road and Westlake Blvd., Ice Age deposits (and Indian artifacts) were found within the late Pleistocene epoch.

5. Located west of Topanga Canyon Road, north of the firebreak road, and south of the Los Angeles City boundary line, a site was recorded, however, material was not identified. The age is late Miocene, Modelo Formation.

6. Located on a ridge west of Schoolhouse Canyon, parts of mammoth teeth and fragments of a horse tooth were found. The age is probably late Pleistocene.

It can be assumed that additional sites could be discovered in parts of the study area, especially vertebrate material from the Pleistocene epoch or in the Modelo Formation.

The types of invertebrate fossils discovered in the study area are all from the Miocene period. The most classic locality in the study area is the "amphitheater", located on Old Topanga Canyon Road near Calabasas Peak Mountain Road. This locality and other locations, further up the road near Dry Canyon have resulted in the discovery of the following specimens:

- Vaquerosella norrisi, a Trask or sandollar
- Pecten neradensis, a scalloped shell
- Mytilus Mathewsoni Expansus, a clam
- Turritella temblorensis, a snail
- Trophon bartoni, a snail
- Plus several other varieties of pectens and gastropods.

Invertebrate fossils (large pectens and other small bivalves) have also been found on Pierman Road west of the intersection with Schueren Road. An impression of a regular echinoid (sandollar) was found along Latigo Road directly south of Castro Peak.

2.3.6 Transportation

The primary means of transporting people and goods within the study area are by private automobiles and trucks utilizing the existing highway system. There are no train, air or significant mass transit systems within the area. As previously described in the Air Quality section (2.2.3) of this chapter, the average daily vehicle miles traveled (VMT) has been obtained from the Los Angeles Regional Transportation Study (LARTS). LARTS is a continuous transportation planning program established in 1960 and functioning under the California Department of Transportation and has the responsibility of monitoring and forecasting travel and providing transportation data within Los Angeles, Ventura and Orange counties and western San Bernardino and Riverside counties.

Within the primary study area the LARTS data had indicated that in 1970 the average daily VMT was approximately 1.7 million and that in 1974 had increased to 2.1 million and is expected to reach 3.5 million by 1990. The latter is based upon previously adopted Southern California Association of Governments (SCAG) population projections for 1990 which have been recently revised downward and would most likely reduce the total VMT projection. LARTS will, in the near future, analyze the new population projections and develop revised traffic projections.

Highway System

The existing highway system within the study area is shown on Figure 51 along with their classification, peak hour traffic volumes and volume/capacity ratios. The roadways are classified in accordance with the Los Angeles County "Master Plan of Highways", as revised June 29, 1972. The peak hour volume counts were made by CALTRANS and the Los Angeles and Ventura County Road Departments. Further breakdown of traffic data by highway section is given in the Appendix Table, "Existing Highway Traffic Loadings".

In order to give an indication of the efficiency at which each highway is presently operating during peak traffic hours, volume/capacity (V/C) ratios were estimated for each section of highway that has similar traffic and roadway characteristics. The V/C ratios shown are based on Level of Service "C", which is defined as follows:

> "Stable Traffic Flow - Traffic speeds and maneuverability area controlled by the higher volumes. Most of the drivers are restricted in their freedom to select their own speed, change lanes or pass.[1] A relatively satisfactory speed is still obtained."

Therefore, if the estimated V/C ratio is less than 1.0, the highway is operating at or below capacity and if the ratio is greater than 1.0, the highway is operating above its capacity for stable flow and motorists will experience varying degrees of congestion and undesirable driving conditions during peak hour traffic conditions.

The following table identifies those highway sections estimated to be operating above level of service "C" capacity during peak traffic hours. The level of service prevailing during those peak hours is identified as either level "D" or level "E". Level of Service "D" is defined as follows:

> "Flow is approaching unstable with temporary restrictions to flow causing substantial drops in operating speeds. Drivers have little freedom to maneuver. Comfort and convenience are low." (Source: Highway Capacity Manual, NRBSR 87, 1965.)

Level of Service "E" is defined as:

> "Flow is unstable with stoppages of momentary duration. Operating speeds are considerably below off-peak traveling speeds with no freedom to maneuver." (Source: Highway Capacity Manual, 1965.)

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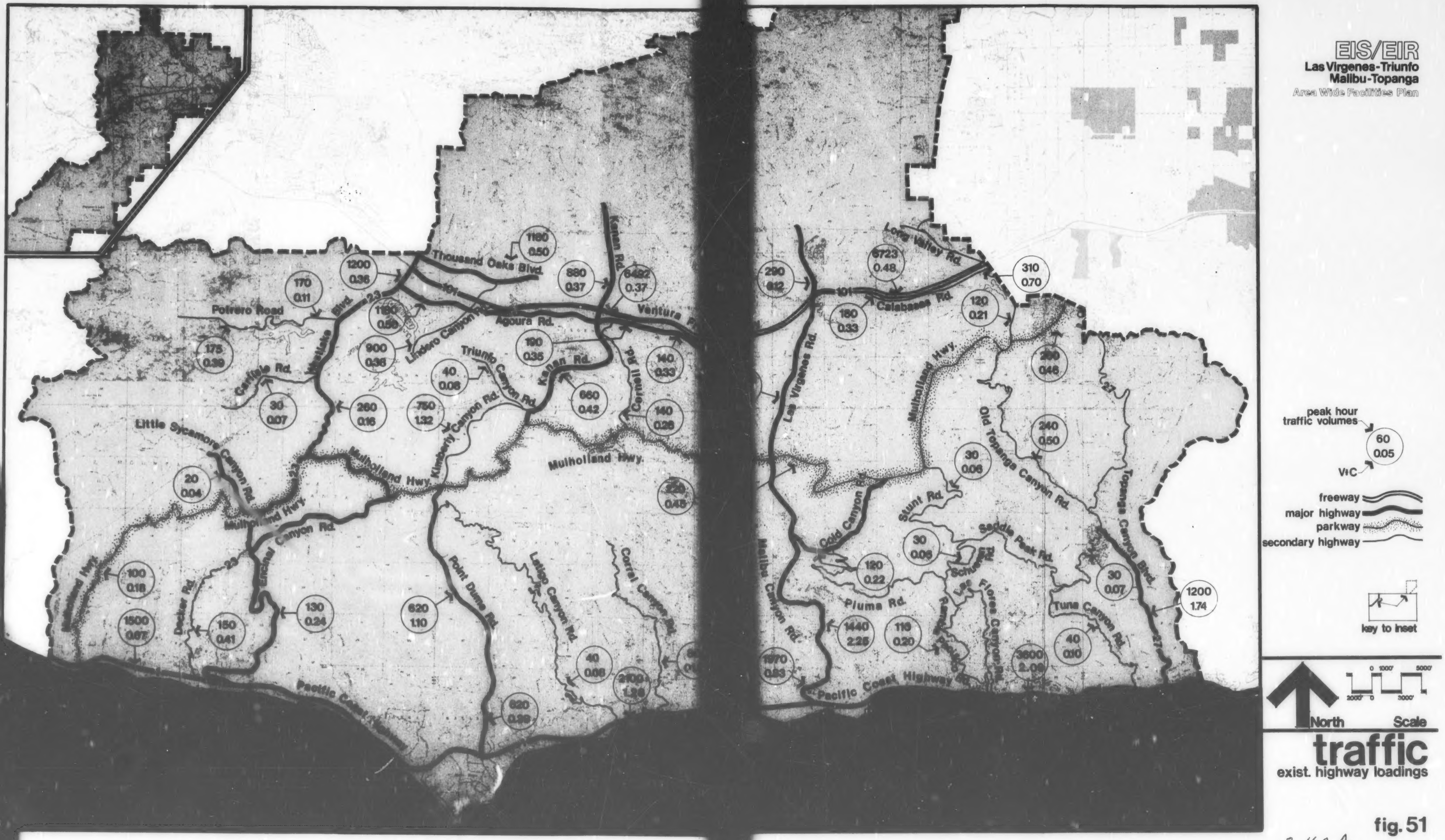
[1] See Highway Capacity Manual, NRBSR 87, 1965.


Thousand Oaks Blvd.
101
23
Potrero Road
Westlake Blvd.
Agoura Rd.
Lindero Canyon Rd.
Ventura Fwy.
Kanan Rd.
Triunfo Canyon Rd.
Cornell Rd.
Carlisle Rd.
Little Sycamore Canyon Rd.
Kimberly Canyon Rd.
Mulholland Hwy.
Encinal Canyon Rd.
Decker Rd.
Point Dume Rd.
Latigo Canyon Rd.
Corral Canyon Rd.
Pacific Coast Highway
Long Valley Rd.
Calabasas Rd.
Las Virgenes Rd.
Cold Canyon Rd.
Stunt Rd.
Old Topanga Canyon Rd.
Topanga Canyon Blvd.
27
Saddle Peak Rd.
Schueren Rd.
Las Flores Canyon Rd.
Rambla Pacifico
Piuma Rd.
Tuna Canyon Rd.
Malibu Canyon Rd.
Pacific Coast Highway
1160 0.50
1200 0.36
170 0.11
1160 0.56
900 0.36
880 0.37
6492 0.37
175 0.39
190 0.35
140 0.33
40 0.08
660 0.42
30 0.07
260 0.16
750 1.32
140 0.26
20 0.04
220 0.45
100 0.18
1500 0.67
150 0.41
130 0.24
620 1.10
40 0.08
2100 1.26
620 0.29
290 0.12
5723 0.48
310 0.70
180 0.33
120 0.21
290 0.46
240 0.50
30 0.06
30 0.06
120 0.22
30 0.07
1200 1.74
1440 2.25
110 0.20
40 0.10
3600 2.09
1970 0.83
peak hour traffic volumes
60
0.05
V:C
freeway
major highway
parkway
secondary highway
key to inset
North
Scale
0 1000' 5000'
2000' 0 3000'

EIS/EIR

Las Virgenes-Triunfo
Malibu-Topanga
Area Wide Facilities Plan

traffic
exist. highway loadings

fig. 51

2.160-A

TABLE 37

Peak Traffic Characteristics

Highway Section	Based on level of Service C, Volume/Capacity (V/C)	Prevailing Level Peak Service
Malibu Canyon Road Civic Center Way to Piuma Road	2.25	"E"
Las Virgenes Road Piuma Riad to Ventura Freeway	2.19	"E"
Pacific Coast Highway Topanga Cyn. Blvd. for 5 mi.	2.09	"D"
for 2 mi.	1.74	"D"
for 8½ mi.	1.28	"D"
Topanga Canyon Boulevard Pacific Coast Highway to Ventura Freeway	1.74	"D"
Kimberly Canyon Boulevard Mulholland Highway to Trifuno Canyon Road	1.32	"D"
Point Dume Road Cavalleri Road to Mulholland Highway	1.10	"D"

The main highway transportation routes transecting the study area are the Ventura Freeway (U.S. Highway 101) and Pacific Coast Highway (U.S. Highway 1). The Ventura Freeway traffic in the study area is mildly congested occasionally during commuter rush hours and increases in congestion as one approaches the Los Angeles City Limits. More serious congestion is encountered on Pacific Coast Highway, particularly east of Malibu (V/C = 2.09 to 1.74). Summer recreational traffic from inland areas causes the worst congestion on Pacific Coast Highway. During summer holidays and weekends as many as 700,000 people per day travel to the coastal Malibu area causing traffic congestion not only on Pacific Coast Highway but Malibu Canyon - Las Virgenes Road and Topanga Canyon Road as well (V/C = 2.25 to 2.19).

Traffic Accidents

Traffic accidents account for about one-half of the accidental deaths in the area. Annual traffic deaths are on the order of 20 per 100,000 people in the study area. For every traffic fatality there are approximately 35 injuries, 450 accidents and $340,000 worth of property damage. Trouble areas for traffic safety occur along Pacific Coast Highway from Malibu to the Los Angeles City Limits. Factors which decrease traffic safety along this route include heavy vehicular and pedestrian traffic on weekends and during the summer, inattention by drivers viewing the scenery, right of way violations by those entering the roadway from adjacent homes or parking areas, and frequent stops made by vehicles along this area.

Transportation Planning Efforts

Transportation planning is in progress to meet transportation problems of the region and the study area. The Southern California Rapid Transit District and its member agencies are currently working towards development of a plan for mass rapid transit, however, transit corridors presently being studied are not in close proximity to the study area and would require some other feeder means to be able to be utilized. California Department of Transportation presently is studying Pacific Coast Highway and Malibu Canyon Road, however, the development of a plan and its implementation may not be realized for some time. Other planning studies in progress include the creation of a scenic corridor for Mulholland Highway by Los Angeles County.

2.3.7 Noise

Noise, a by-product of man's existance, is a composite of three major types: transportation, industrial and miscellaneous noises. The most predominant and widespread source of noise in the study area can be traced to transportation. The two main sources of motor vehicle noise are exhaust and interaction between vehicle tires and the roadway. Other sources of noise that are attributed to the automobile, trucks, etc. are brake noises, vehicle horns and aerodynamic noises.

The study area is generally a quiet contrast to the more developed and noisier areas beyond the Los Angeles City limits to the east. The quiet regions of the study area are interspersed by residential development pockets and transportation corridors. Most of the development in the study area can be typified as normal or quiet suburban residential. The daytime average ambient noise levels for these types of residential areas are described in Figure 52. (Included with Figure 52 is an acoustical scale to illustrate various types of noises with their typically associated sound levels.)

Quiet can be considered a resource necessary for human health and well-being. The noise level for potential hearing loss begins at about 70 decibels -- a level commonly exceeded in an urbanized environment.

Studies done on communities in isolated areas of Africa indicate that what we accept as a normal loss of hearing with age may be instead an attrition accelerated by chronic exposure to noise. More important, however, is the stress borne by the body due to the automatic physical reactions accompanying perceptions of noise. The ambient noise level in urban and suburban areas similar to the study area is rising at the rate of about 1 dB per year.[1] These noise increases affect individuals to different degrees; about one-tenth of the population is particularly sensitive to noise. It is possible that many from this segment of the population have selected residences in the study area, choosing to make the financial and commuting sacrifices necessary to obtain the benefits of a relatively quiet environmental setting.

The study area contains many regions used for recreation; the beaches and undeveloped mountain areas provide many with a quiet rest from their normal noisy urban setting. The

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[1] Donley, R., "Community Noise Regulation", Sound and Vibration, 3, (Feb. 1959).

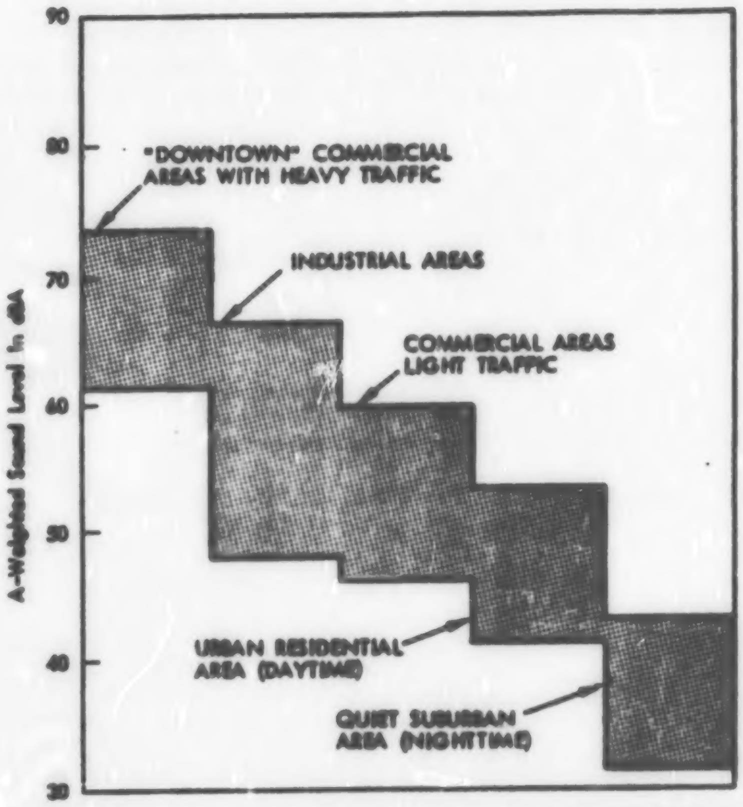
ACOUSTICAL SCALE

		dBA*	
LETHAL		–180–	
		–175–	
		–170–	
		–165–	
		–160–	
		–155–	
		–150–	
		–145–	
	Sonic Boom	–140–	
		–135–	
THRESHOLD OF PAIN		–130–	
	Jet Takeoff at 200'	–125–	
		–120–	
		–115–	Discotheque
PHYSICAL DISCOMFORT	Motorcycle at 20'	–110–	
		–105–	Power Mower
		–100–	
	Freight Train at 50'	–95–	Newspaper Press
	Propeller Plane Fly-over at 1,000'	–90–	Food Blender
		–85–	Electric Mixer
	Freeway Traffic at 50'	–80–	Washing Machine; Alarm Clock; Garbage Disposal; Electric Can Opener
		–75–	Office with Tabulating Machines
	Average Traffic at 100'	–70–	Vacuum Cleaner; Portable Fan
		–65–	Electric Typewriter at 10'
		–60–	Dishwasher Rinse at 10'; Air Conditioning Unit
		–55–	
		–50–	Normal Conversation at 12'
	Light Traffic at 100'	–45–	Refrigerator
		–40–	
		–35–	Library
		–30–	
		–25–	
		–20–	Motion Picture Studio
		–15–	
		–10–	Leaves Rustling
		–5–	
THRESHOLD OF HEARING		–0–	

* The unit of sound is the decibel (dB). The loudness of sound is typically measured using a sound meter, the A-Scale of which corresponds closely to the way the human ear perceives sound. Thus the sound level for noise evaluations is frequently expressed in dBA.

FIGURE 52

TYPICAL CONTINUOUS BACKGROUND NOISE LEVELS



Source: NCHRP Report 117

Noise Element of the Los Angeles County General Plan describes such undeveloped areas as assets which provide needed silence and solitude and which must be protected against future noise level increases (Los Angeles County General Plan, Preliminary Noise Element; July 17, 1974, page 5).

Since transportation noise is the most prominent source of noise in the study area and relative quiet is desirable within the area, future urban planning must pay close attention to traffic flows and their attenuating noise.

Existing highway noise conditions were estimated and are shown on Figure 53. The noise levels shown were calculated according to methods described in "National Cooperative Highway Research Program (NCHRP) Report 117, 1971, and represent average noise levels that occur at the roadway right-of-way line during peak hour traffic periods that are exceeded 50 percent of the time. Generally the highest estimated noise levels occurred on the highways with high traffic volumes and where the travel lanes are close to the right-of-way line. For comparison, Figure 54 shows typical arterial highway and freeway noise levels at varying distances away from the roadway. The highest noise levels in the study area occur on the Ventura Freeway and Pacific Coast Highway. Other highway sections with relatively high noise levels (70 dBA and greater) are as follows:

1. Malibu Canyon Road, Pacific Coast Highway to Piuma Road.
2. Agoura Road, Ventura Freeway to Westlake Boulevard.
3. Las Virgenes Road, Piuma Road to Ventura Freeway.
4. Thousand Oaks Boulevard.
5. Topanga Canyon Boulevard.
6. Westlake Boulevard.

As the traffic volumes on these and other sections of highway in the study area increase, so will the traffic noise levels. These increases in noise level need not necessarily go unabated. Several noise control features can be incorporated into future highway designs including sound walls, earth mounding and depression of the roadway. Sound attenuation using these methods can be as much as 15 dBA (National Cooperative Highway Research Program, Report 117, 1971).

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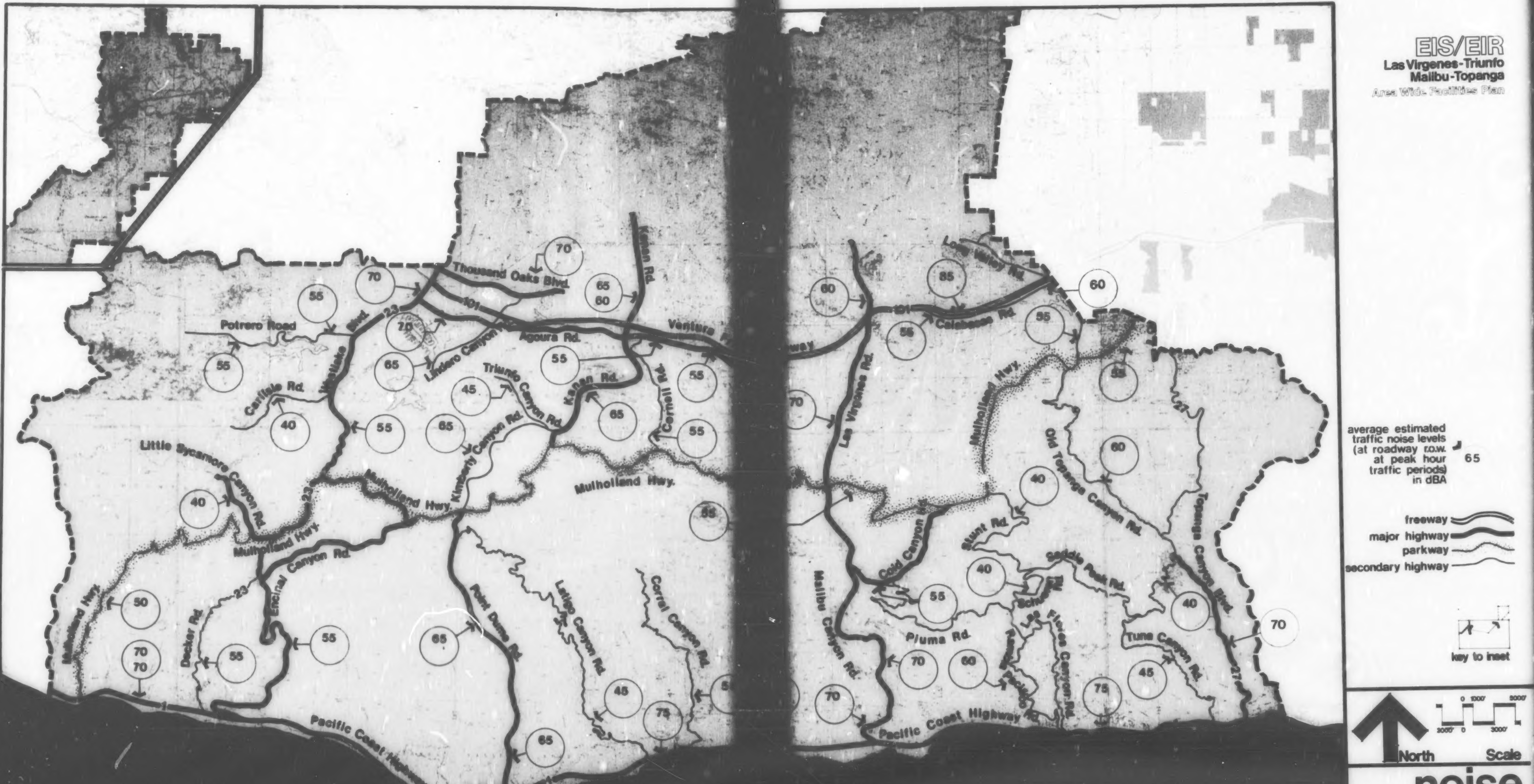
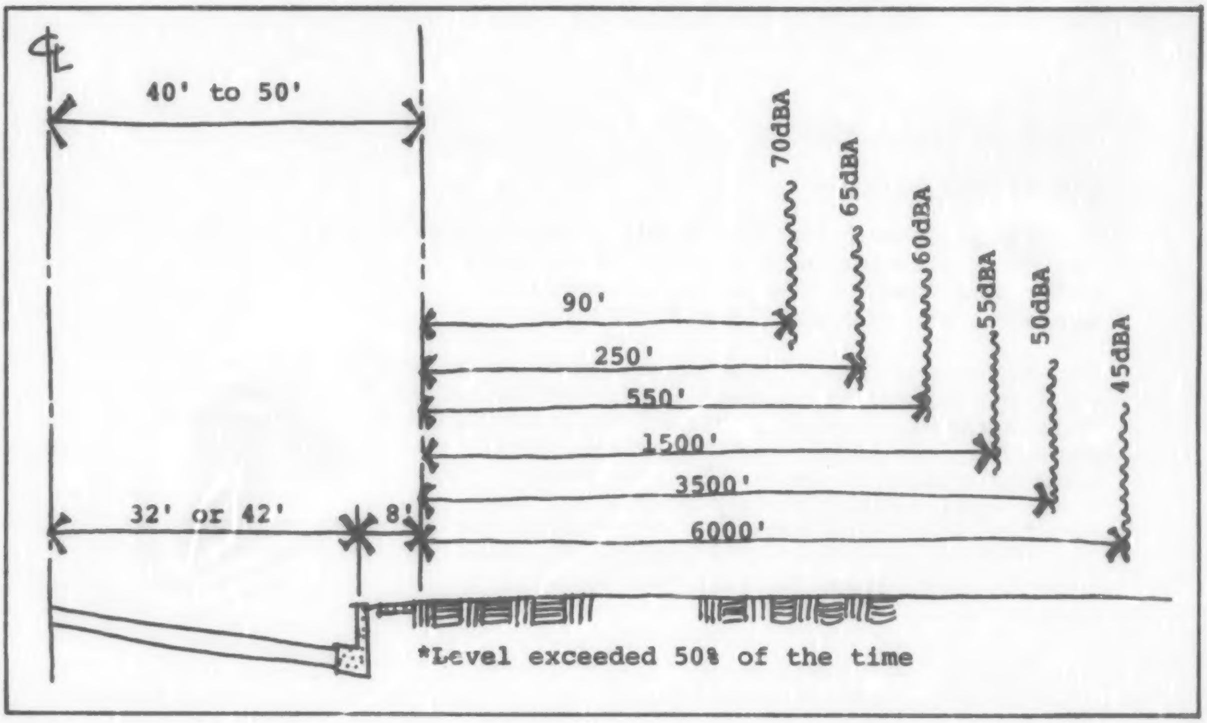
Malibu-Topanga
Area Wide Facilities Plan


Potrero Road
Westlake Blvd.
Carlisle Rd.
Little Sycamore Canyon Rd.
Mulholland Hwy.
Decker Rd.
Encinal Canyon Rd.
Thousand Oaks Blvd.
101
23
Lindero Canyon
Agoura Rd.
Triunfo Canyon Rd.
Kanan Rd.
Kimberly Canyon Rd.
Ventura Freeway
Cornell Rd.
Point Dume Rd.
Latigo Canyon Rd.
Corral Canyon Rd.
Pacific Coast Highway
1
Las Virgenes Rd.
Malibu Canyon Rd.
Cold Canyon Rd.
Long Valley Rd.
Calabasas Rd.
Old Topanga Canyon Rd.
Stunt Rd.
Saddle Peak Rd.
Schueren Rd.
Piuma Rd.
Rambla Pacifico Rd.
Las Flores Canyon Rd.
Tuna Canyon Rd.
Topanga Canyon Blvd.
27
70
70
55
55
70
65
55
40
55
65
45
55
65
60
65
55
55
40
50
70
70
55
55
65
45
75
65
60
60
85
56
55
55
70
60
40
40
55
70
60
70
75
45
40
70
60
average estimated traffic noise levels (at roadway r.o.w. at peak hour traffic periods) in dBA
65
freeway
major highway
parkway
secondary highway
key to inset
0
1000'
5000'
2000'
0
3000'
North
Scale

noise
exist. highway conditions

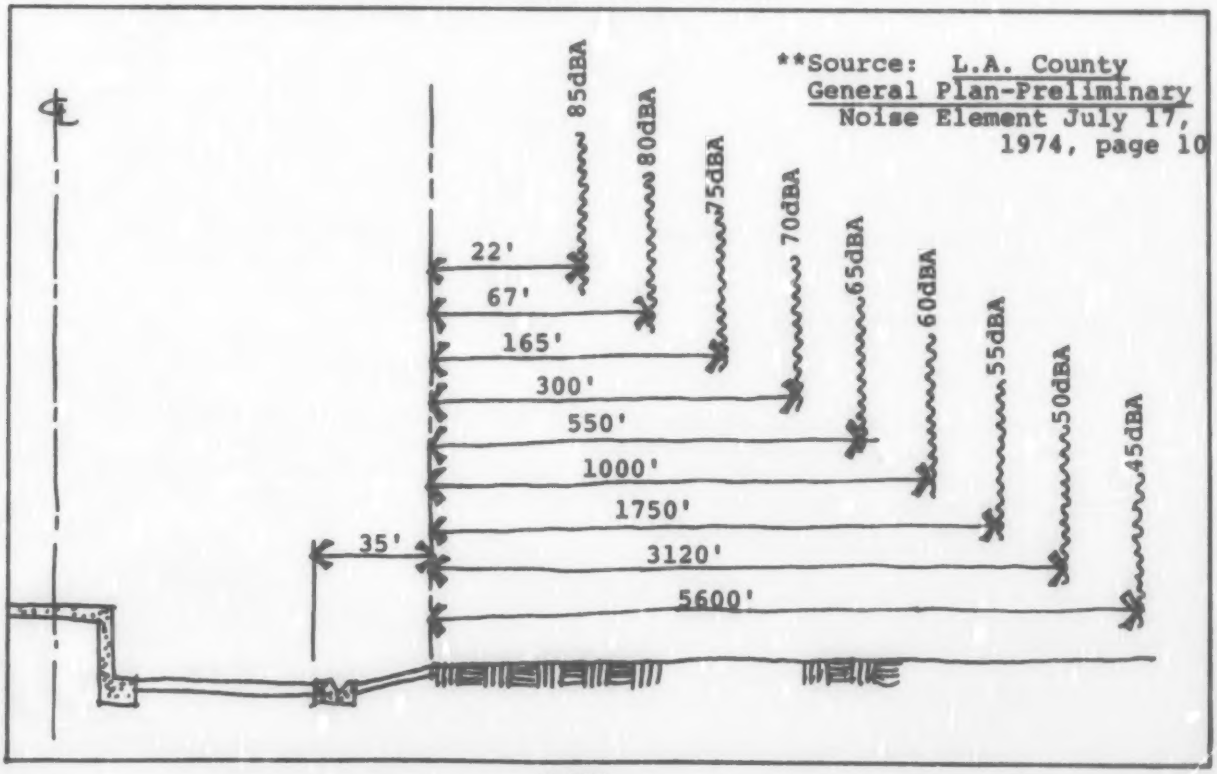
fig. 53

FIGURE 54
TYPICAL ARTERIAL HIGHWAY NOISE LEVELS (L_{50})*


℄
40' to 50'
70dBA
65dBA
60dBA
55dBA
50dBA
45dBA
90'
250'
550'
1500'
3500'
6000'
32' or 42'
8'

*Level exceeded 50% of the time

TYPICAL FREEWAY NOISE LEVEL**


℄
85dBA
80dBA
75dBA
70dBA
65dBA
60dBA
55dBA
50dBA
45dBA
22'
67'
165'
300'
550'
1000'
1750'
3120'
5600'
35'

**Source: L.A. County General Plan-Preliminary Noise Element July 17, 1974, page 10

2.3.8 Utility Systems

Electrical Service

Electrical power for the study area is provided by Southern California Edison and City of Los Angeles Department of Water and Power. The major transmission lines and substations are shown. (See Figure 55.)

The major portion of the study area is served by Southern California Edison through their Southern California network. This network enables Southern California Edison to transfer energy by computer control as required. Service by this network makes it impossible to identify the sources of electrical energy at any specific time. Within the Southern California Edison network, hydroelectric generation provides approximately 12% of the generated power; nuclear generating plants, less than 1%; and the remaining 87+% is from fossil fuels.

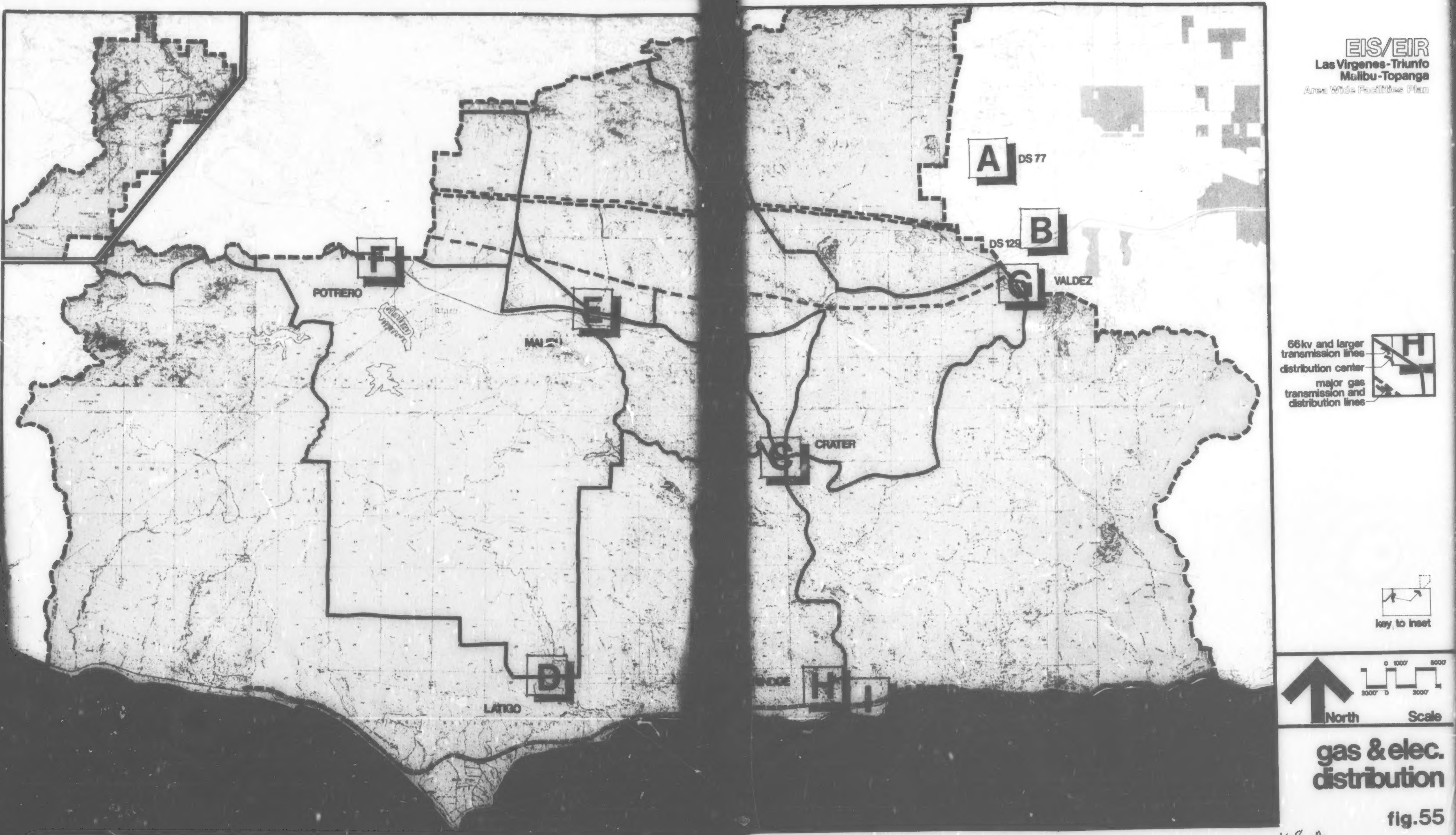
The major distribution centers as noted on the plan are summarized here:

Distribution Center	Present Operating Peak	Design Capacity
A	34 Mva	50 Mva
B	25 Mva	35 Mva
C	14,500 Kva	18,000 Kva
D	9,300 Kva	9,000 Kva
E	23,000 Kva	22,400 Kva
F	31,800 Kva	35,300 Kva
G	22,800 Kva	28,000 Kva
H	3,000 Kva	3,000 Kva
I	Future	22,400 Kva

The differences noted between A, B, and the remainder of the stations is accounted for by different primary voltage as used by the City of Los Angeles and Southern California Edison respectively.

Natural Gas

Distribution of natural gas within the study area is provided by the Southern California Gas Company. The company maintains major transmission and distribution lines throughout the area. There are no storage facilities within the study area. (See Figure 55).


A
DS 77
B
DS 129
G
VALDEZ
F
POTRERO
E
MALIBU
G
CRATER
D
LATIGO
RIDGE
H
I
66kv and larger transmission lines
distribution center
major gas transmission and distribution lines
H
key to inset
North
0 1000' 5000'
2000' 0 3000'
Scale

EIS/EIR
Las Virgenes-Triunfo
Malibu-Topanga
Area Wide Facilities Plan

gas & elec. distribution

fig.55

168-A

Domestic service is generally limited within the study area, with provisions only within a narrow corridor paralleling Pacific Coast Highway (1/2 mile) on the south and penetrating the study area from the north only along major roads as far as Mulholland Highway.

The availability of natural gas for the entire state has, in the past three years, been rapidly declining. Supplies have diminished and current reserves are diminishing. Southern California Gas Company officials have indicated that if no new supplies or reserves are found, the resources currently being utilized could be exhausted in approximately 15 years. These resources, however, do not included those offshore reserves.

Realizing the criticality of this stiuation, the California Public Utilities Commission issued Order 96-A in December, 1975. This order provided for a system of end-use priorities for statewide allocation of natural gas based on criteria contained in the order.

The order had the greatest impact on those non-residential customers whose peak day consumption demands are greater than 50 thousand cubic feet (Mcf) per day. The PUC also recognizes that the residential gas customer and the small commercial customer have the least amount of flexibility to change from gas to some alternative fuel. Based on this lack of flexibility, present residential and small commercial and industrial customers (users with peak-day demands less than 100 Mcf/d) will be accorded the highest priority rating to receive the available natural gas resources.

Domestic Water Supply

The Metropolitan Water District of Southern California (MWD) is a public agency with the responsibility of providing water to the many water wholesalers of distributors within southern California. The principal sources of water for the MWD are the Colorado River and the State water project (Feather River waters). Originally, most of the water supplied to the study area had its source at the Colorado; however, with the completion of the state water project, more and more demand is being placed on that source. Almost all MWD water currently supplies to the study area is state water project, Feather River water. It should be pointed out that this water has been at an exceptionally low cost since a 20 year contract between the State of California and electrical utility suppliers established a fixed price for power to pump water into Southern California. This contract expires in 1983 and it has been estimated by the Metropolitan Water District that power costs could rise seven times greater than persent contracted power costs which could substantially increase the cost of water. It has been indicated by LVMWD that this proable increase, along with other cost increases due to inflation, could cause the cost of domestic water in the area to rise in ten years from the present $170 per acre/foot to $250 per acre/foot.

The study area is comprised of three major water districts: the Las Virgenes Municipal Water District, Calleguas Municipal Water District, and the West Basin Municipal Water District. Within the boundaries of these major districts are several smaller water retailers or purveyors. These purveyors purchase water from (1) one of the major three wholesalers, (2) directly from MWD, or (3) obtain their own water from localized groundwater supplies. These districts are shown elsewhere in this chapter under jurisdictional boundaries. Because of the nature of the study area, the history of land use, and the topography, there are also many individual privately-owned wells operating. The amount of water or quality of water being supplied either for domestic, agricultural or industrial use from these sources is impossible to estimate due to the lack of data.

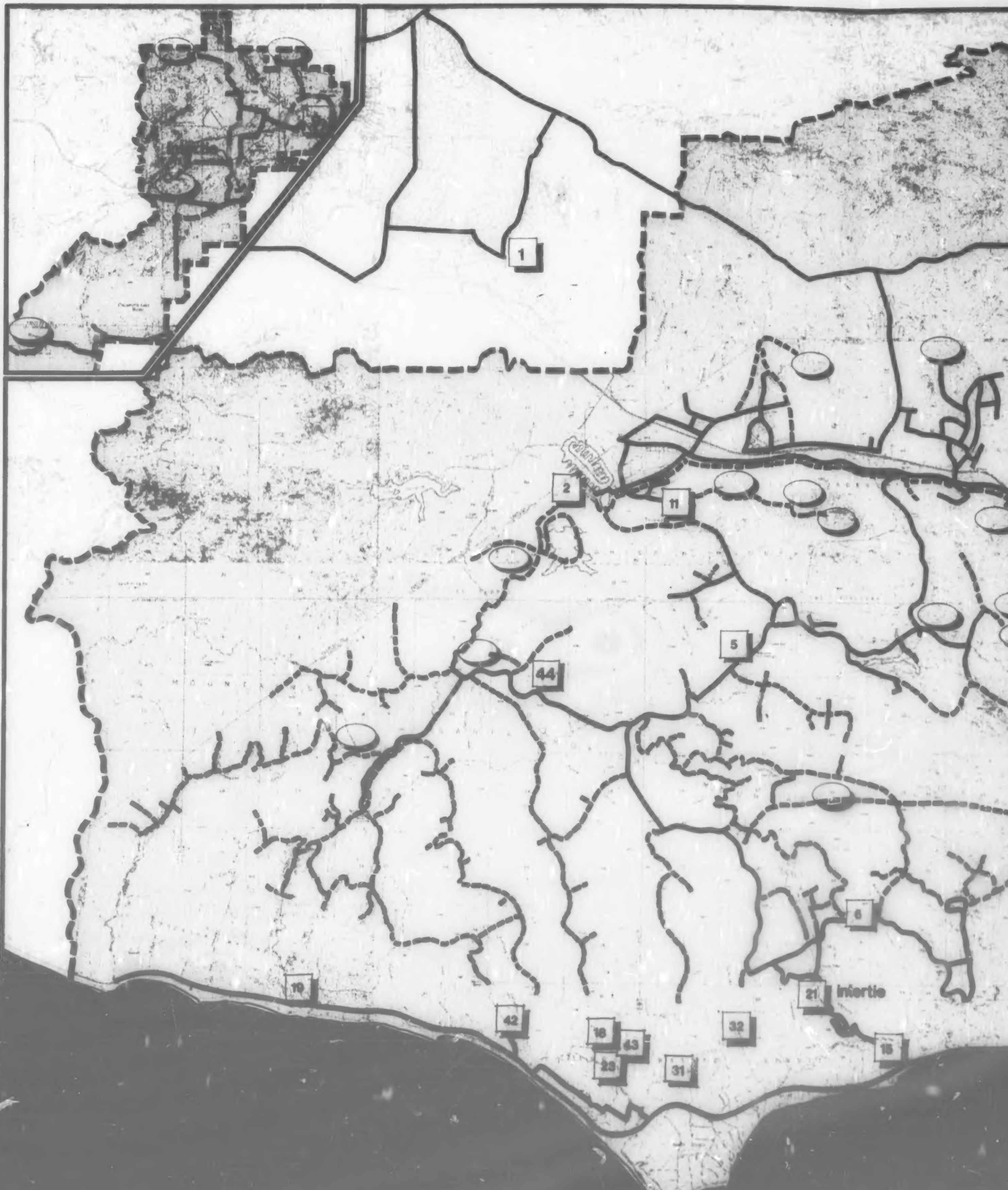
The existing and proposed major water distribution lines and water storage facilities are shown in Figure 56.

The Regional Water Quality Control Board estimates the study area had approximate demands of 10,200 acre-ft./year in 1970. These demands shall increase to 15,800, 22,500, and 26,300 for the respective 1980, 1990 and the year 2000 periods. Affecting this increase will be a doubling of the population and an expected increase of about 25% in the average gallons per capita per day from the present 264 to 325. Increase in per capita useage, however, is doubtful at this time due to potential increases in water supply costs.

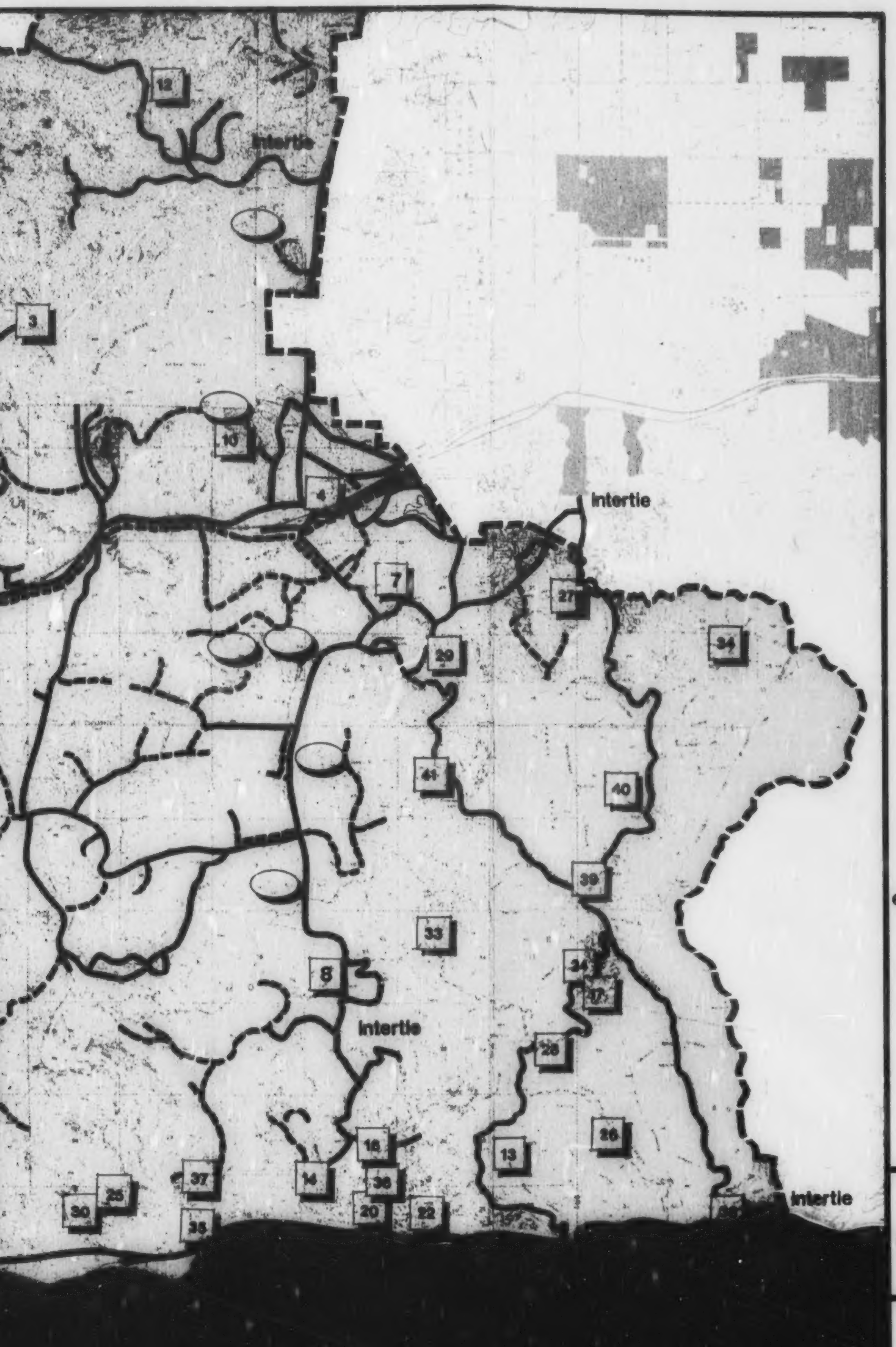
The LVMWD, being the largest supplier within the study area, should grow accordingly from present use of about 8,000 acre feet/year to 10,900, 15,700 and 18,100 for respective years of 1980, 1990 and the year 2000.

Of the total amount of water supplied to the study area, approximately ten percent is consumed for industrial uses. The Regional Water Quality Control Board has predicted that this figure will increase to sixteen percent by the year 2000.

A study has been made of agricultural uses of water within the study area regarding the amounts of water needed for propagation of crops common to the area. (See Table 38.) This data could be valuable in determining potential use of treated effluent for irrigation uses. The Regional Water Quality Control Plan predicts a decrease in water demand for agricultural use within the study area by the year 1990.


1
2
11
5
44
6
19
42
18
43
23
31
32
21
Intertie
15

EIS/EIR
Las Virgenes-Triunfo
Malibu-Topanga
Area Wide Facilities Plan



12
Intertie
3
10
4
7
Intertie
27
29
34
41
40
39
33
8
24
17
Intertie
28
26
13
18
14
36
37
25
30
35
20
22
Intertie
existing storage
existing water lines
proposed water lines
proposed storage
23
key to inset
North
Scale
0
1000'
5000'
3000'
0
3000'

domestic water

fig.56

2-170-A

TABLE 38

ANNUAL AGRICULTURAL WATER DEMAND

Crop	Unit Applied Water Demand (Acre-Ft/Acre)	1970		1980		1990		2000	
		Net Irrigated Acreage	Water Demand (Acre-Ft/Yr)	Net Irrigated Acreage	Water Demand (Acre-Ft/Yr)	Net Irrigated Acreage	Water Demand (Acre-Ft/Yr)	Net Irrigated Acreage	Water Demand (Acre-Ft/Yr)
Alfalfa	2.9	350	1,015	350	1,015	300	870	300	870
Pasture	3.1	–	–	–	–	–	–	–	–
Citrus and Subtropical	1.6	–	–	–	–	–	–	–	–
Truck Crops and Nursery	3.2	150	480	150	480	100	320	100	320
Field Crops	2.4	–	–	–	–	–	–	–	–
Deciduous Fruits and Nuts	2.0	–	–	–	–	–	–	–	–
Small Grains	0.9	–	–	–	–	–	–	–	–
Vineyards	1.4	–	–	–	–	–	–	–	–
Subtotal		500	1,495	500	1,495	400	1,190	400	1,190

Sanitary Sewerage

Existing wastewater treatment facilities range from individual septic tanks and small treatment plans with surface disposal (irrigation) or subsurface disposal (leach fields or pits) to municipally served sewers.

The type of facility used is not related to development patterns, but more to the topography and jurisdiction areas. Individual septic tanks serve single dwelling units as well as multiple apartments, trailer units and commercial developments.

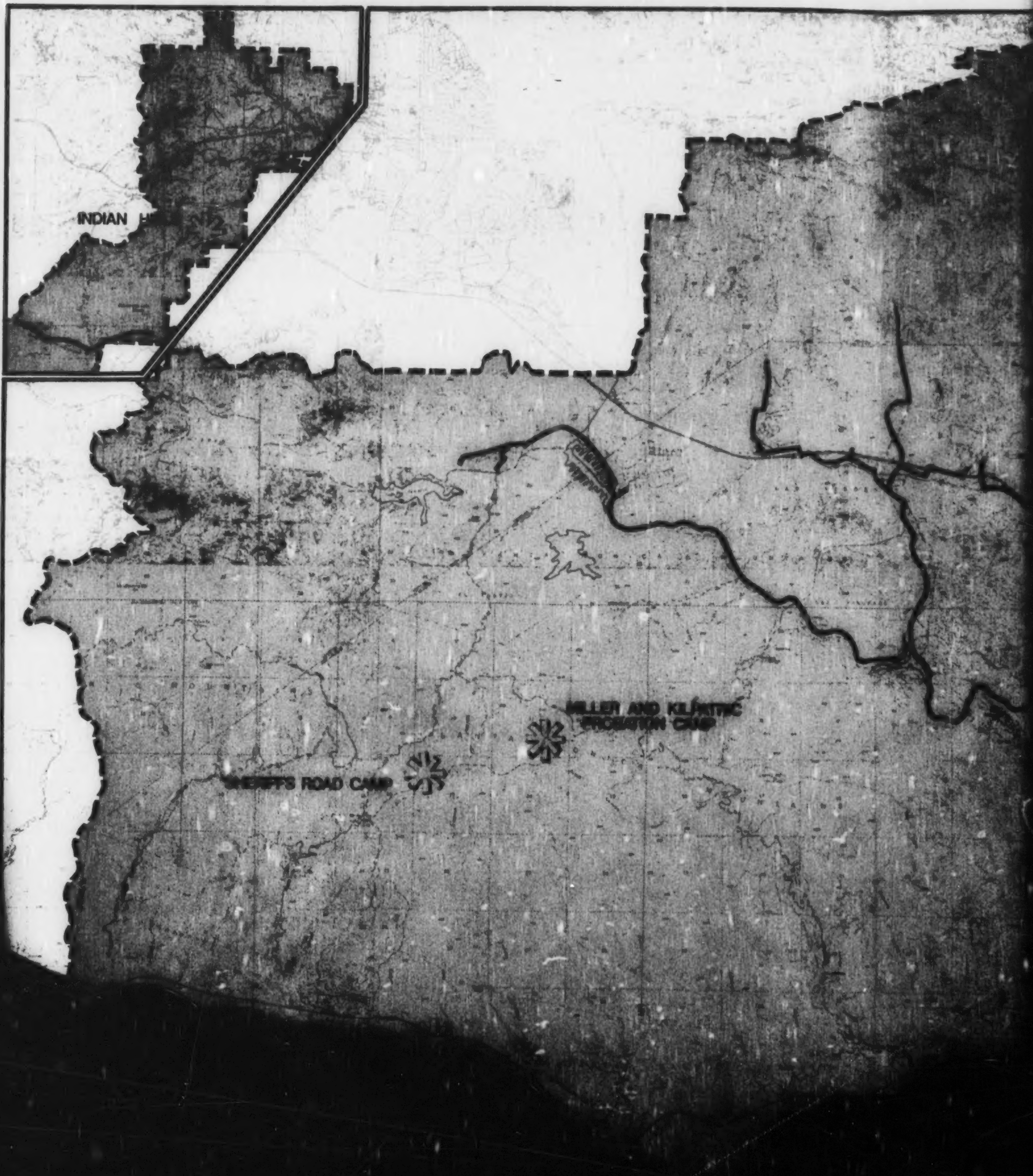
Location of significant treatment facilities within the study area are shown on Figure 57 and Table 39 describes these facilities.

Because of the topography, history of land use and relatively short period of time that Las Virgenes Municipal Water District and Triunfo County Sanitation Districts have been in existence, there are individual uses of septic systems even within the bounds of the districts.

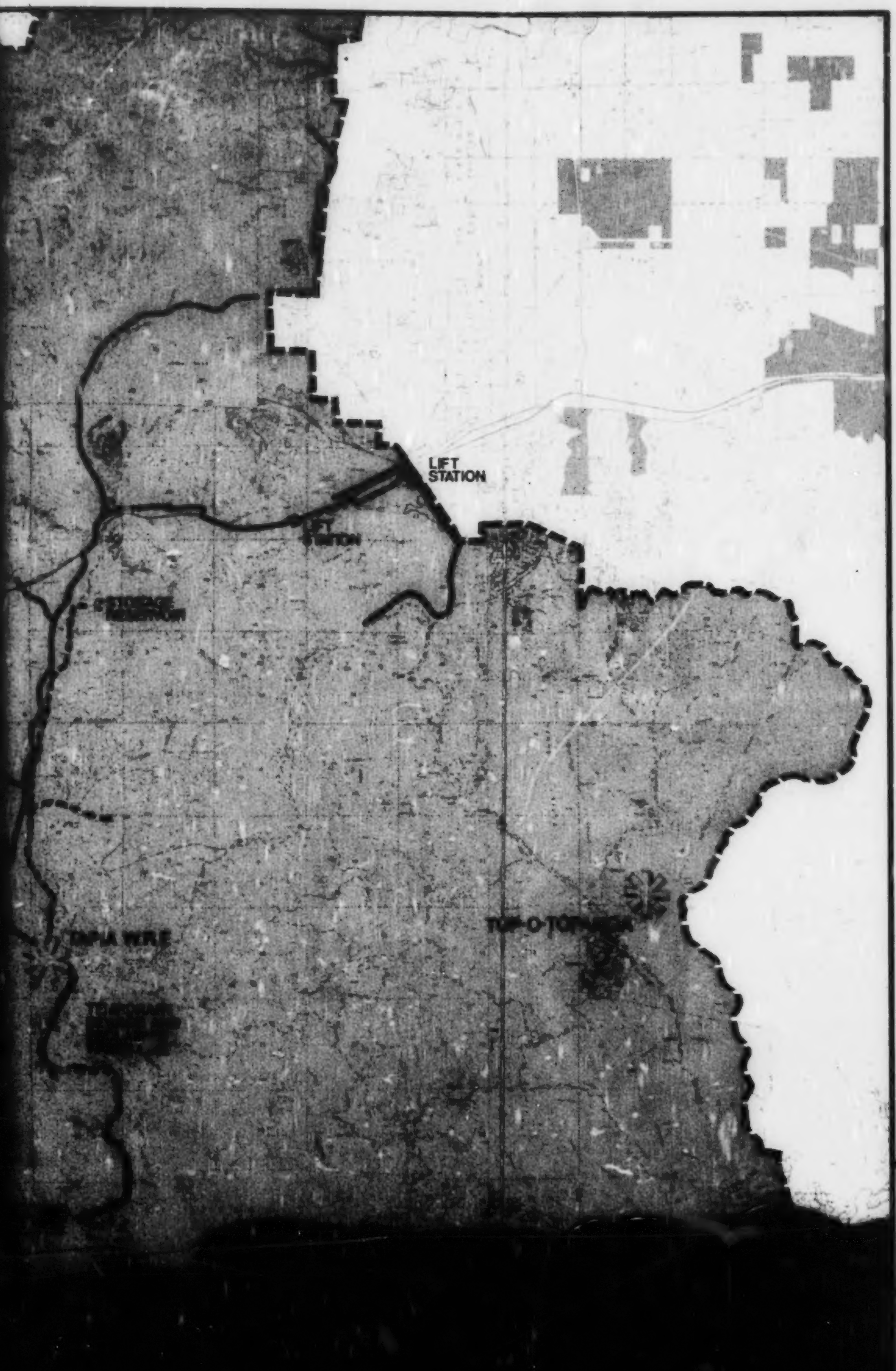
The Triunfo County Sanitation District covers more than 22,000 acres of the northwest portion of the study area and provides sewerage facilities under terms of a 1964 joint powers agreement with Las Virgenes Municipal Water District. The Triunfo district also includes a 1,600 acre area of Ventura County known as the Bell Canyon area which is also being served by the Tapia Water Reclamation Facility.

In 1963, the Las Virgenes Municipal Water District formed a sanitation improvement district to serve the areas within the water district draining into Malibu Canyon, an area of approximately 38,500 acres. In 1964, another sanitation improvement district was formed to include the Calabasas area of the water district, an area originally served by the 100,000 gallons per day Mulwood Treatment Plant which was abandoned at that time. The area is approximately 5,300 acres.

The Tapia treatment facility constructed under the joint powers agreement, was constructed within the LVMWD due to its position "downstream" of the Triunfo district. LVMWD presently has capacity rights to 5.65 mgd of the design capacity of 8 mgd. The district now has approximately 6,000 sewer service connections.


INDIAN H
MILLER AND KILPATRIC PROBATION CAMP
SHERIFFS ROAD CAMP

EIS/EIR
Las Virgenes-Triunfo
Malibu-Topanga
Area Wide Facilities Plan


LIFT STATION
LIFT STATION
STORAGE RESERVOIR
TAPIA W.R.F
TOP-O-TOPANGA
trunk sewer
reclaimed water line
treatment plant
key to inset
North
0 1000' 5000'
2000' 0 3000'
Scale

sanitary sewerage

fig. 57

2-172-A

TABLE 39

EXISTING SEWAGE TREATMENT FACILITIES

PLANT	POP. SERVED	DESIGN CAPACITY	DISCHARGE RATE	TYPE OF TREATMENT	EFFLUENT DISPOSAL METHOD
Trancas Canyon	730	160,000 gpd	120,000 gpd	Primary, anaerobic sludge digestion	Leaching field
Point Dume	700	70,000 gpd	30,000 gpd	Secondary, activated sludge, oxidation pond & chlorination	Spray irrigation
Latigo Bay Shores	125 apts.	30,000 gpd	n.a.	Secondary, activated sludge, extended aeration, filtration	Leach field
Lechuza Point	6 homes	12,600 gpd		Secondary, activated sludge, extended aeration	Leach field
Malibu Canyon		37,000 gpd	12,000 gpd	Secondary, Activated sludge, effluent filtration	Seepage pit
Sheriffs Road Camp	125	20,000 gpd	15,000 gpd	Advanced primary extended aeration	Evaporation pond
Miller & Kilpatrick Probation Camp	300	39,900 gpd	40,000 gpd	Advanced primary extended aeration chlorination	Spray irrigation, excess to stream in Zuma Canyon
Tapia Water Reclamation Facility	37,000	4 mil. gpd	4.2 mil gpd	Secondary, activated sludge, chlorination	Spray irrigation & wet weather stream discharge
Top-O-Topanga	400	35,000 gpd	21,000 gpd	Secondary, activated sludge, chlorination	Spray irrigation
Indian Hills Mobile Home Village	250	27,000 gpd	13,000 gpd	Secondary, activated sludge, oxidation pond, spray irrigation	Spray irrigation

Under the provisions of the joint powers agreement, Triunfo currently has capacity rights to 2.35 million gallons per day of the Tapia facilities' design capacity of 8 million gallons per day. This capacity serves approximately 3,000 sewer service connections within the district.

The Tapia facility has grown to this size through a series of actions. The plant was first placed in operation in October, 1965, with a capacity of one-half million gallons per day. In June, 1968, an addition to the plant was completed, bringing the total capacity to 2.0 mgd. In 1971 the second expansion of the Tapia plant was placed in partial service. This work, completed in 1972, brings the sewage treatment capacity of the plant to 8 mgd, except for sewage sludge handling and some other minor facilities not brought up to the full 8 mgd capacity.

The plant utilizes a treatment process which mixes sewage with large quantities of air in the process. The resultant combination of organic material and abundant air supply produces an environment capable of supporting a large population of bacteria and micro-organisms which feed on the sewage and convert it to more stable chemical compounds. This is referred to as an activated sludge process.

The reclaimed water from the Tapia Plant is currently being delivered in five ways:

1. It is sold to customers for irrigation of agricultural crops and landscaping.

2. After purchase of an agreed amount of water, the customer may also permit surplus reclaimed water to be spray irrigated.

3. The District disposes of water on its own spray field and utilizes it for washdown and landscaping around the Tapia Water Reclamation Plant.

4. The District recently constructed percolation ponds across Las Virgenes Road from the Tapia WRF to dispose of the effluent it cannot reclaim by the above means.

In addition to these disposal methods, reclaimed water may be discharged into Malibu Creek during and immediately after periods of wet weather. The District has also recently received permission from the Regional Water Quality Control Board to discharge into the Creek from mid-November through mid-March. The Board has set stringent water quality standards that must be met in order for this disposal to occur.

Existing sewage solids handling facilities consist of aerobic digestion of primary and excess secondary solids followed by chemical coagulation and mechanical dewatering. The dewatered solids are then disposed primarily on agricultural lands as fertilizers upon request of local farmers and by verbal agreement only. Any excess dewatered sewage solids are disposed at County of Los Angeles landfill site Number 5 (a Class 1 site).

Effluent Disposal

The disposal of effluent water and sewage solids throughout the study area is handled in different ways. Individual septic tanks dispose of effluent water through leach fields or pits. The Regional Water Quality Board estimates there were approximately 4,800 private subsurface sewage disposal installations within the study area in 1970. Sewage solids from these installations are collected by truck and hauled to the Tapia plant. It has been estimated that approximately 1,750 septic tanks are pumped each year[1] and LVMWD has indicated that it receives an average of approximately 30,000 gallons per day of tanked-in sewage.

Smaller treatment plants within the study area dispose of their effluent by either leach fields or limited spray irrigation systems adjacent to the treatment plants. Solids are again hauled to the Tapia facility for processing.

The Tapia facility, operated by LVMWD is presently treating approximately 4.2 mgd. The effluent is disposed of primarily by spray irrigation. As a result of an order of the Los Angeles Regional Water Quality Control Board in 1970, the joint venture installed a reclaimed water system to enable the effluent from the Tapia plant to be removed from Malibu Creek and insofar as possible, to be put to beneficial use. The first phase of this plan was placed in service in November, 1971. It provided for pumping the effluent from Tapia to a 36 acre-foot storage reservoir located at District headquarters near Las Virgenes Road and the Ventura Freeway. From here, reclaimed water is distributed to customers for use and on LVMWD's own spray fields.

In addition to this use of reclaimed water for agricultural purposes, effluent is also discharged to Malibu Creek during wet periods when the soils of the spray areas are saturated. These discharges are accomplished under permit by the Regional Water Quality Control Board. The Board also allows discharge from mid-November through mid-March in addition to the wet weather discharges.

The quality of the treated effluent is represented in Table 40, by an analysis of the effluent in 1975.

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[1] Boyle Engineering

TABLE 40

1975 EFFLUENT ANALYSIS, TAPIA WATER RECLAMATION FACILITY

Constituent	Units	Annual Average Minimum	Annual Average Maximum	Annual 30-Day Average	Daily Maximum
$BOD_5 20^\circ C$	lbs/day*	35	271	131	322
	mg/1	1	7	3	9
Suspended Solids	lbs/day*	28	423	127	871
	mg/1	.8	11	3	24
Settleable Solids	mg/1	<.1	<.1	<.1	<.1
Oil & Grease	lbs/day*	7	33	17	92
	mg/1	.2	.9	.4	2.8
Turbidity	Turbidity Units	.7	3.4	1.6	6.1
Total Coliform	MPN/100 ml	<2	5	<2 (median)	70 (7 day mean)
Fecal Coliform	MPN/100 ml	<2	<2	<2 (median)	33 (7 day mean)
Nitrate	lbs/day*	377	626	510	704
	mg/1	10.7	17.8	14.5	20
Ammonia	lbs/day*	1.05	137	35	384
	mg/1	.03	3.9	1	10.9
Phosphate	lbs/day*	887	1,246	1,052	1,478
	mg/1	25.2	35.4	29.9	42

* Based on 4.2 mgd flow rate

Source: LVMWD

Discharge Limitations

The Regional Water Quality Control Board has placed the following limitations upon discharge: The discharge of wastes by Las Virgenes Municipal Water District to surface waters or tributaries thereto shall be limited to the following discharge conditions:

1. Cold-weather discharge between mid-November and mid-March. This discharge shall be limited to flow in excess of that which can be reclaimed for beneficial use.

2. Discharge during and immediately after periods of rain but not more than one day (24 hours) after such periods unless the spraying grounds are so thoroughly saturated they will not absorb additional water, as determined by tensiometers installed in the spraying areas or by another effective method approved in advance by the Executive Officer.

Effluent Limitations

1. Wastes discharged to Malibu Creek shall be limited to treated municipal wastewater, as proposed.

2. The discharge of an effluent in excess of the following limits is prohibited:

a. For Discharges During and Immediately After Periods of Rain

Parameter	Units	30-Day Average	7-Day Average	Daily Maximum
BOD_5 20°C	lbs/day*	1,340	---	2,000
	mg/l	20	---	30
Suspended solids	lbs/day*	1,000	---	2,670
	mg/l	15	---	40
Settleable solids	ml/l	0.1	---	0.2
Oil and grease	lbs/day*	670	---	1,000
	mg/l	10	---	15
Turbidity	TU	2	---	5
Fecal Coliform	MPN/100 ml	200	400	2,000

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* For maximum 8 mgd. flow rate

b. For Cold-Weather (Mid-November to Mid-March) Other than the Above (a)

Parameter	Units	30-Day Average	7-Day Average	Daily Maximum
BOD_5 20°C	lb/day*	670	---	1,340
	mg/l	10	---	20
Suspended solids	lbs/day*	335	---	670
	mg/l	5	---	10
Settleable solids	ml/l	0.1	---	0.2
Oil and grease	lbs/day*	335	---	670
	mg/l	5	---	10
Turbidity	TU	2	---	5
Fecal coliform	MPN/100 ml	200	400	2,000

* For maximum 8 mgd. flow rate

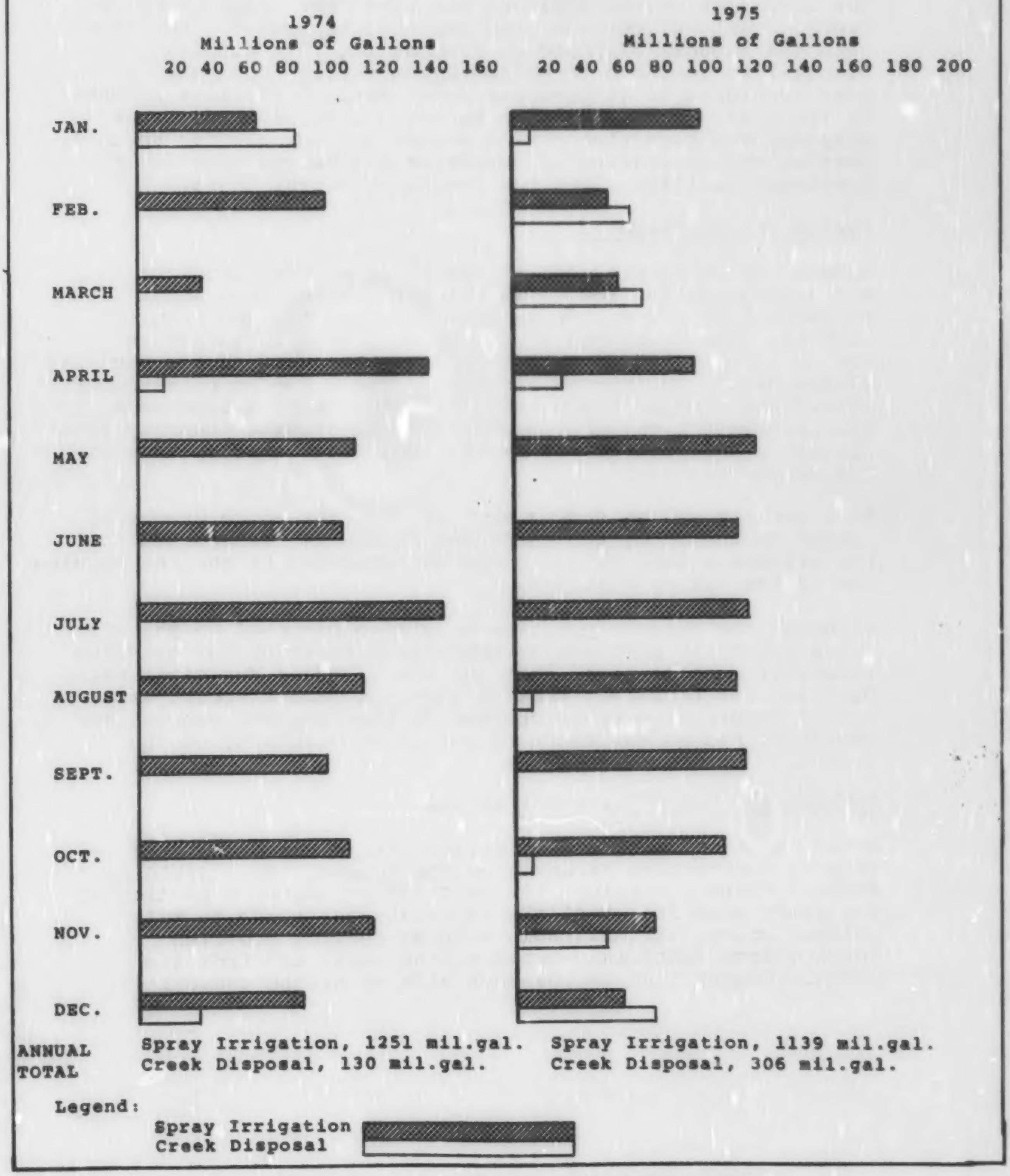
Reclaimed Water Useage

The major use of reclaimed water from the Tapia facility is agriculture with a smaller amount going for landscape irrigation. In 1974, LVMWD was able to sell 188 million gallons of reclaimed water and an additional 1,063 million gallons were disposed by spray irrigation. In 1975, 239 million gallons were sold and an additional 900 million gallons were disposed by spray irrigation. The major users of reclaimed water are located in close proximity to the Tapia treatment plant and are as follows:

Location	Use	Total Amount (MG)
Claretville Farms (Claretian Seminary)	Sudan Grass, permanent pasture and landscaping	176.4
Sampo Ranch	Alfalfa	186.6
Pepperdine University	Landscaping	36.4
State Lands (Formerly Hope and Century Ranch)	Pasture	138.8
Rondel	Pasture	48.5
Hunter Ranch	Pasture	94.9
Tapia	Landscaping, Washdowns	200.7

TABLE 41

COMPARATIVE AMOUNTS OF EFFLUENT DISPOSAL 1974, 1975



ANNUAL TOTAL

Spray Irrigation, 1251 mil.gal.
Creek Disposal, 130 mil.gal.

Spray Irrigation, 1139 mil.gal.
Creek Disposal, 306 mil.gal.

Source: LVMWD 1974 and 1975 Effluent Analysis Summary

The remainder of the effluent has been discharged to Malibu Creek. Table 41 compares the amounts disposed to the Creek with the amounts disposed on land during 1974 and 1975. Disposal to land and to Malibu Creek varies from year to year according to differences in climatic conditions as shown in Table 42. It should also be noted that in 1975, Creek disposal was permitted during August and October for special testing and monitoring of nutrients discharged from the Tapia treatment facility along the course of Malibu Creek.

Sewage Solids Disposal

Sludge now being produced at the plant -- corresponding to 4 mgd average daily flow -- is being thickened from about 2.0% to about 9.0% dry solids in dual cell gravity thickeners (DCG's). The thickened sludge is collected in dumpsters, and it is then transported to private property in the vicinity (Sampo Ranch) and spread on open ground. The property owner allows the sludge to dry, then uses the dried sludge as a soil supplement on other pastures. The private property owner charges a fee, set at his discretion, for the acceptance of the sewage sludge.

As a back-up system during very wet weather which precludes access to the site, the thickened sludge is transported to the Calabasas Landfill -- owned and operated by the Los Angeles County Sanitation District.

Although the present practice of sludge disposal on private lands currently provides an economical solution for existing flows, it must be noted that the Las Virgenes Municipal Water District has no direct control over the land disposal site, nor of future fees to be charged by the property owners, and therefore has no assurance of continued viability of the method.

Rubbish and Solid Waste Collection

Solid waste collection is provided within the study area by several contractors licensed by the County. (1) Hillside Rubbish Company services the majority of northern portion of the study area from Westlake to Calabasas, south to Mulholland Drive; (2) Alladdin Rubbish Service provides service from Mulholland Drive to the coast and from the Ventura County line to the east side of Malibu Canyon; (3)

TABLE 42

AVERAGE MONTHLY MALIBU CREEK DISCHARGE AND SPRAY IRRIGATION DISPOSAL FROM TAPIA WRF

	1972				1973				1974				1975			
	Creek		Irrigation		Creek		Irrigation		Creek		Irrigation		Creek		Irrigation	
	mgd	cfs	mgd	cfs	mgd	cfs	mgd	cfs	mgd	cfs	mgd	cfs	mgd	cfs	mgd	cfs
January			2.15	3.327	.024	.037	3.103	4.801	2.8	4.332	2.042	3.159	.348	.538	4.191	6.484
February			2.0	3.094	1.86	2.878	1.856	2.872			4.590	7.102	2.182	3.376	2.927	4.529
March			2.175	3.365	1.417	2.192	1.737	2.688			4.8	7.427	2.258	3.494	3.136	4.852
April			2.155	3.334			3.190	4.936	.406	.628	4.273	6.611	.8375	1.296	4.1835	6.473
May			2.145	3.319			3.33	5.152			4.787	7.407			4.902	7.584
June			2.178	3.370			3.004	4.648			4.67	7.226			4.922	7.615
July			2.150	3.327			2.827	4.374			4.699	7.27			4.136	6.399
August			2.426	3.754			3.062	4.738			4.38	6.777	.339	.525	3.793	5.869
September			2.704	4.184			3.176	4.914			4.357	6.741			4.280	6.622
October			2.77	4.286			3.944	6.102			4.594	7.108	.323	.5	3.783	5.853
November	.087	.135	2.675	4.139	.747	1.156	3.691	5.711			4.524	7	1.589	2.459	2.401	3.715
December			2.940	4.549	.152	.235	4.157	6.432	1.002	1.55	3.623	5.606	2.303	3.563	1.877	2.904
TOTAL	871 mg/yr.				1,255 mg/yr.				1,381 mg/yr.				1,445 mg/yr.			

Azteca Rubbish Service provides the majority of service along the eastern portion of the study area and the northeast corner. Other smaller contractors provide service within the major territories. G. K. Rubbish services selected sites along the coast, while Las Virgenes Refuse Company collects around Malibu Lake.

All contractors dispose of collected refuse at the County landfill located in Calabasas. Per capita solid waste generation has been increasing rapidly in the United States. In 1920, there were 2.75 pounds of solid waste produced per person per day. By 1970 this figure rose to 5.30 pounds per person per day, and in 1980 is projected to reach 8.00[1] pounds per day. Based on these figures and the population projections found in the regional water quality control plan, the area is currently producing about 92 tons per day of rubbish or solid waste. In 1980, projections would indicate approximately 197 tons per day. These figures do not include solid waste generated as sludge from the Tapia water reclamation facility.

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[1] Boyle Engineering

3.0 Project Alternatives

3.0 PROJECT ALTERNATIVES

3.1 INTRODUCTION

The project alternatives described in this chapter deal with alternatives for (1) a reclaimed water line from the existing storage reservoir at LVMWD headquarters to a golf course and (2) sewage solids handling at the Tapia WRF. These alternatives form a part of the AWFP, but have been separated from the AWFP to eliminate delay resulting from the necessity of further studies of other elements of the AWFP. The background for this separation of elements has been described in Chapter I, Introduction.

In this chapter, separate sections have been prepared to describe the preferred reclaimed water line, as well as other alternatives considered, and preferred sewage solids handling alternatives.

3.2 CALABASAS RECLAIMED WATER LINE ALTERNATIVES

3.2.1 Location

The area for the LVMWD - Calabasas Park Reclaimed Water Line is located south of the Ventura Freeway near the City of Hidden Hills and near the communities of Agoura and Calabasas. The western limits of the area would be Las Virgenes Road. See Figure 58. The proposed project is to permit pumping of reclaimed water from the LVMWD storage reservoir, behind its headquarters, to the Calabasas Park Golf Course, located approximately 3 miles to the east.

3.2.2 Objectives of the Reclaimed Water Line

The objectives of the proposed project include an increase of land area for the spray irrigation of reclaimed water from the Tapia Water Reclamation Facility, as well as the lessening of use of imported freshwater by a private golf course, private orchards, and landscaped greenbelts. The latter would be accomplished by the substitution of reclaimed water for imported freshwater.

At the present time, reclaimed water from the Tapia WRF is spray irrigated on private and state-owned lands under limited agreements. Reclaimed water is sold to private customers for irrigation of agricultural crops and landscaping. Upon purchase of an agreed amount of reclaimed water, the customer may also permit surplus reclaimed water to be spray

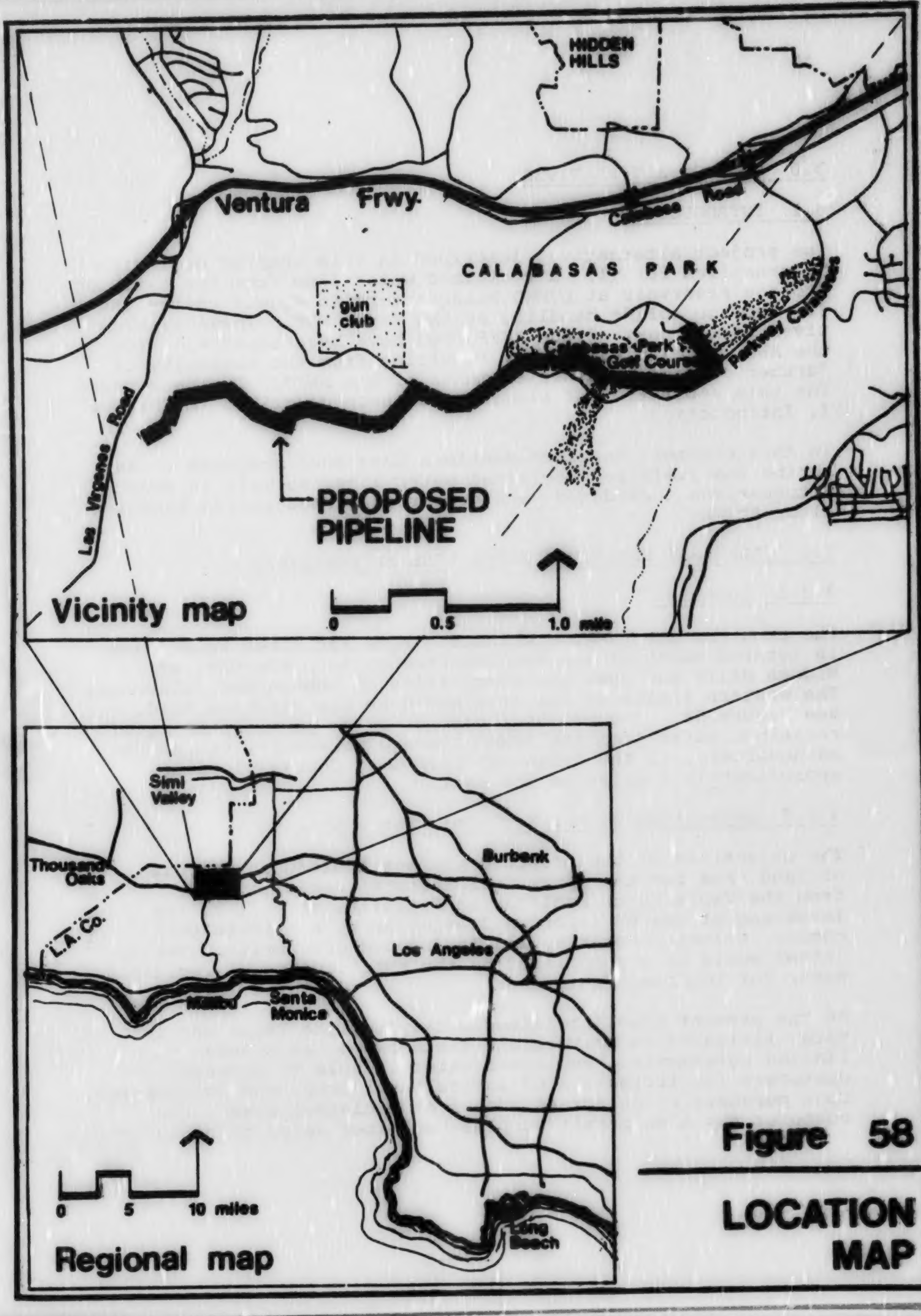

HIDDEN HILLS
Ventura Frwy
Calabasas Road
CALABASAS PARK
gun club
Calabasas Park Golf Course
Parkway Calabasas
Las Virgenes Road
PROPOSED PIPELINE
Vicinity map
0
0.5
1.0 mile
Simi Valley
Thousand Oaks
Burbank
L.A. Co.
Los Angeles
Malibu
Santa Monica
Long Beach
0
5
10 miles
Regional map

Figure 58

LOCATION MAP

irrigated. LVMWD also spray irrigates native pasture land under limited agreements with various landowners, as well as spraying its own spray fields and landscaping. A number of percolation/seepage ponds have also been constructed to dispose of the reclaimed water it cannot reuse by the above means. The LVMWD is also able to discharge treated wastewater into Malibu Creek during the winter (mid-November through mid-May) as well as during and immediately after periods of rain.

The immediate problem which LVMWD is attempting to partially resolve by the proposed project is to alleviate the criticality of limited agreements enabling spray irrigation of the reclaimed water. Due to geological constraints of the area, there is limited land suitable for irrigation and/or disposal, and if agreements are cancelled or dissolved, there is little the LVMWD can do. The State Department of Parks and Recreation has notified LVMWD that after December 1978, it will no longer allow spray irrigation of 110.2 acres of State owned land. Also a 32-acre area currently used for spray irrigation (known as the Hunter Ranch) is under condemnation proceedings by the State; thus, it may also become unavailable to LVMWD. Additionally, a 53-acre parcel, the Rondell property, will be developed in 1978 and will be unavailable for spray irrigation.

If these agreements are cancelled or dissolved, the District would not be able to discharge into Malibu Creek as it does not have a permit other than winter-time discharge. Furthermore, there are no more additional lands in the immediate area having suitable characteristics that would be made available without purchase. The purchasing of these lands are to be considered in the Draft Addendum (after a decision is made by the SWRCB concerning year-round discharge into Malibu Creek), but the immediacy of the problem is such that the District cannot afford the luxury of waiting for final studies to be completed.

With the construction of the proposed reclaimed water line, a greater acreage of land, capable of utilizing reclaimed water, will be made available to LVMWD. Long-term agreements for the purchase of the reclaimed water can then be finalized, and LVMWD will then have a greater flexibility and greater margin in the ability to reuse and dispose of its reclaimed water.

The second objective, lessening use and reliance upon imported freshwater, would result from the construction of the pipeline and the availability of the reclaimed water. At this time, agreements have been entered into by the LVMWD with the owners/operator of the Calabasas Park Golf Course for long-term purchase of the reclaimed water for irrigation. The agreement states that 500 acre-feet per year is to be used.

An additional 500 acre-feet of water per year may also be used on the adjacent orchard-ranchettes subdivision (Parkway Calabasas). At the beginning of the subdivision development, approximately 200 acre-feet of reclaimed water will be needed to irrigate crops associated with the development, and by the seventh year of development, the required annual acre-feet of water is expected to be 350 acre-feet a year. An additional 150 acre-feet a year will be used for general landscaping and miscellaneous water needs.

The total amount of reclaimed water pumped to the Calabasas Golf Course and the adjacent subdivision could be approximately 1,000 acre-feet of water per year.

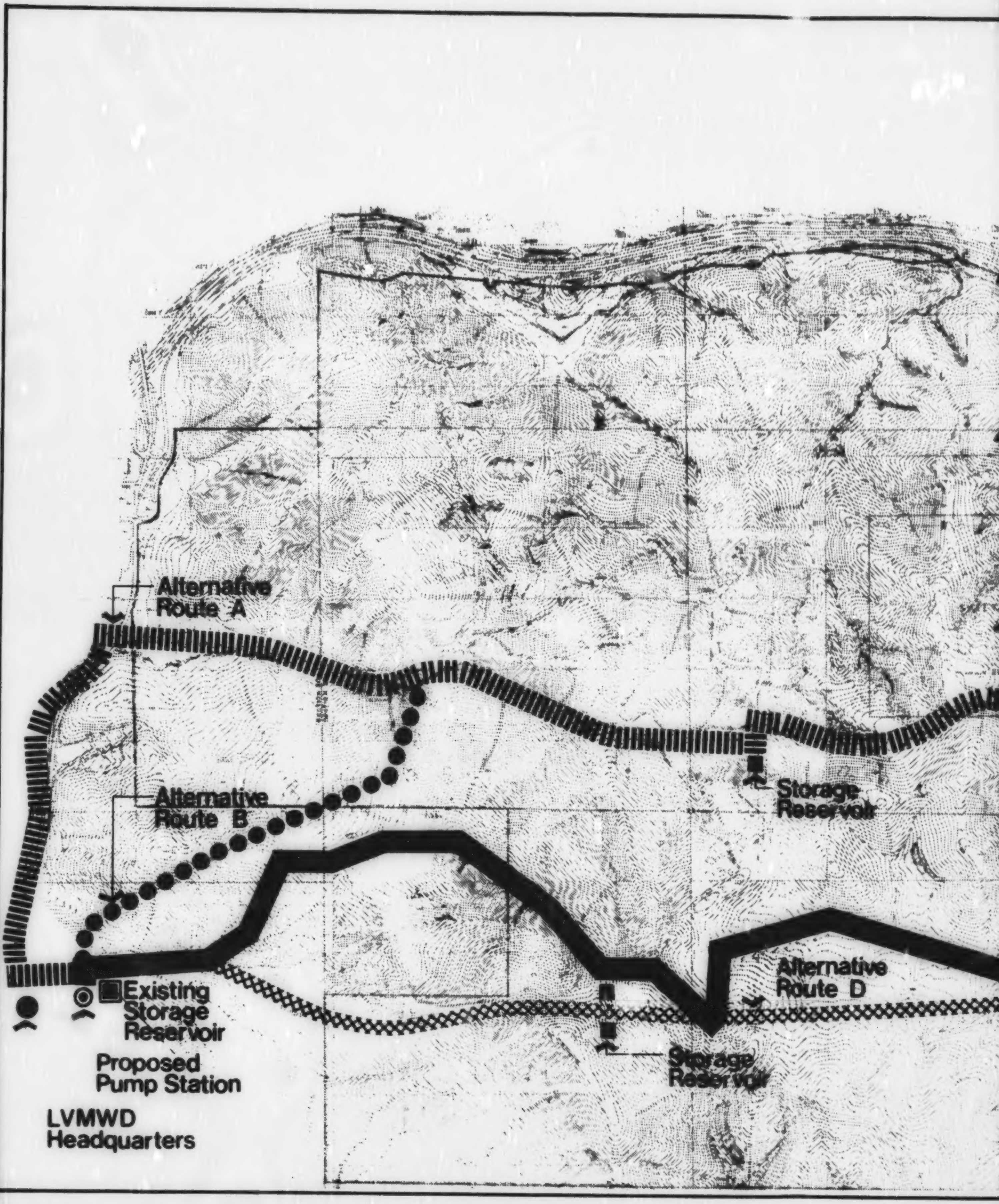
It should be noted that the developers of Calabasas Park estimate that they expect a wastewater generation of 118 million gallons per year from their development which would be considerably less than the quantity that would be reused for irrigation.

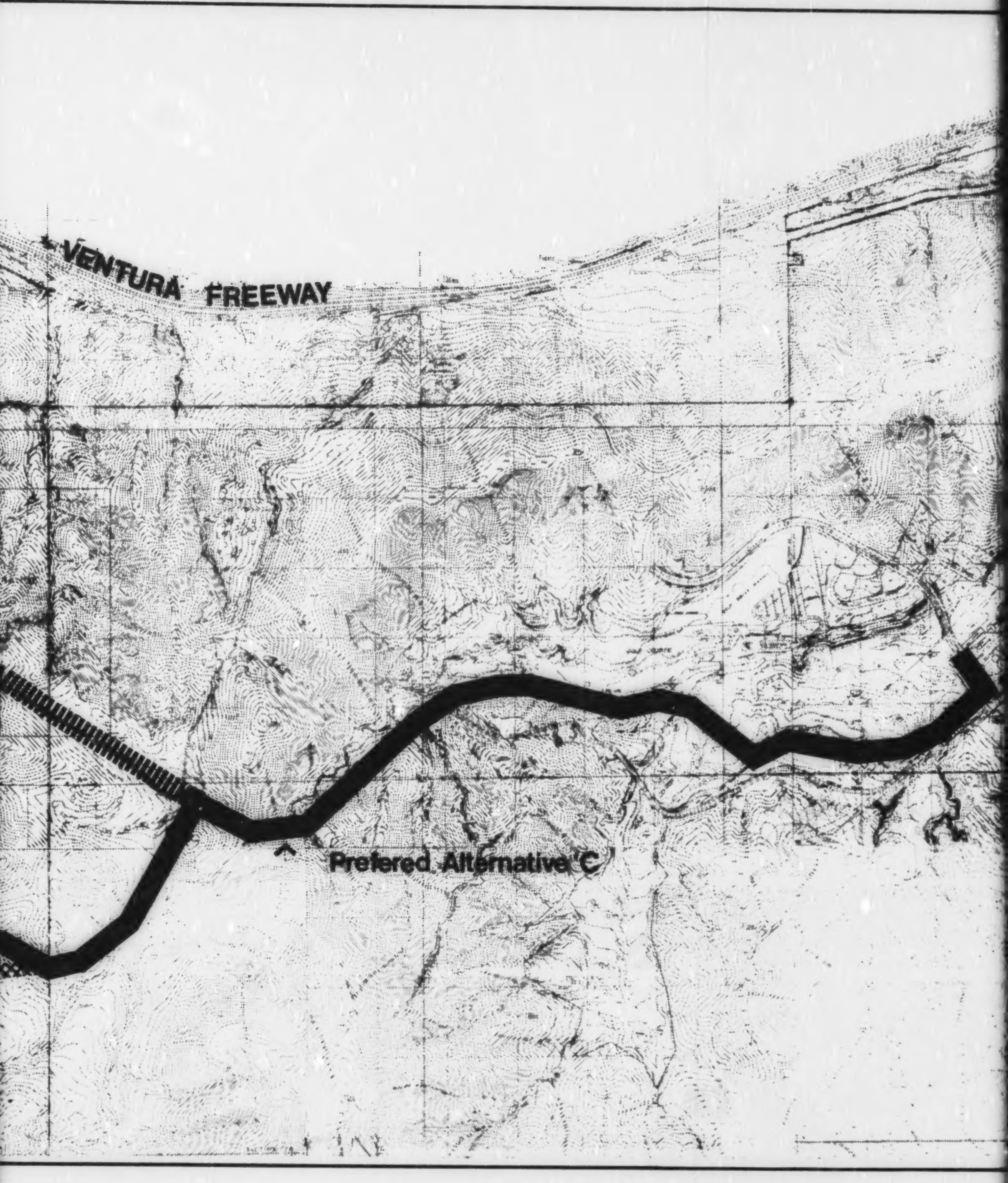
Other potential users of reclaimed water have expressed an interest in being able to connect with the reclaimed water line. This would further enable a lessening of the reliance on imported freshwater.

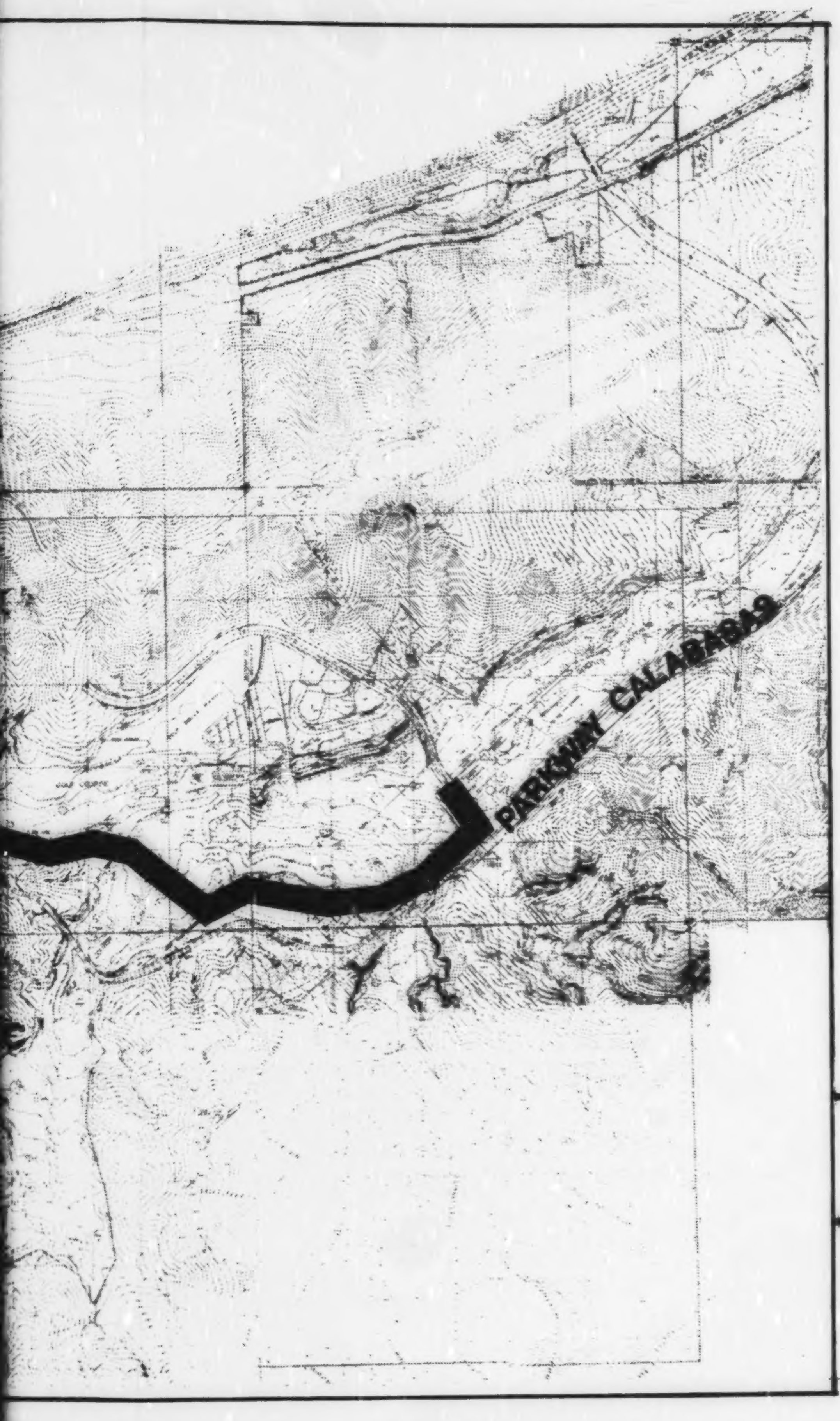
Potential users include the City of Hidden Hills and developers and landowners in the area. The City of Hidden Hills has indicated that an ordinance requiring all new developments to have dual water systems would be enacted if reclaimed water becomes available so that reclaimed water will be able to be utilized for landscape irrigation purposes. Other developers and landowners in the general vicinity are also strongly considering the use of dual water systems.

3.2.3 Preferred Alternative

The preferred alternative (Alternative C, Figure 59) consists of a 14 inch pipeline of approximately 17,765 feet in length which will extend from the existing reclaimed water balancing/storage reservoir located behind the LVMWD office at Las Virgenes Road, northeasterly to the first ridge line, then


Alternative Route A
Alternative Route B
Storage Reservoir
Alternative Route D
Existing Storage Reservoir
Storage Reservoir
Proposed Pump Station
LVMWD Headquarters


VENTURA FREEWAY
Prefered Alternative 'C'


PARKWAY CALABASAS

EIS/EIR
Las Virgenes-Triunfo
Malibu-Topanga
Area Wide Facilities Plan

fig. 59

0 300 600 1200 feet

reclaimed water line alternatives

easterly up a steep slope to a ridge, then angling southeast to a high point (approximate elevation 1,536). At this high point, a small lined reservoir (600,000 gallon) will be cut into the top of the ridge. From the reservoir the pipeline will generally follow the alignment of an existing dirt road to a point where a proposed road (extension of Parkway Calabasas) of a planned subdivision begins. The proposed subdivision road is to generally follow the present alignment of an existing dirt road leading to McCoy Canyon. The pipeline will follow this alignment and will be buried generally to a depth of 3 feet. In certain areas, it will not be possible to trench to this depth and, therefore, the pipeline may be at a shallower depth or placed on the surface. The pipeline will consist of 4,945 feet of force main and 12,820 feet of gravity line. Approximately 400 horsepower would be required for pumping of peak flow.[1] The pump station is expected to be located near the existing balancing/storage reservoir.

The proposed project must be able to supply, at appropriate times of the day, both the Calabasas Park Golf Course irrigation needs as well as the proposed Parkway Calabasas subdivision orchards, through which it must pass. The golf course is expected to irrigate at night and would require 1,600 gallons per minute at the existing zone water service which is 1,475 feet head (this will deliver 115 psi at the highest green elevation) at the connection point to the existing irrigation system. The orchard use would most likely occur during the day and its demand requirement would be satisfied by the design criteria of the golf course demand.

Preliminary construction cost estimates are as follows:

Force main, 14" dia., 4,945 feet	$ 111,455
Gravity line, 14" dia., 12,750 feet	274,530
Storage Reservoir	69,600
Pump Station, 400 h.p.	160,000
Right-of-Way	30,000
Subtotal	$ 645,585
Engineering, legal, and contingencies	190,823
Total	$ 836,408

Energy consumption rates for Alternative C are based upon the amount of energy it will require to pump an average flow of 1,451 acre-feet per year or approximately 1.3 mgd of

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1. This is based on an operating efficiency of approximately 70%.

water to the Calabasas Golf Course and adjacent orchards. The daily energy consumption rate is approximately 1,143 kwh/acre-foot. This amount of energy consumed is less than two-thirds the amount required to pump imported fresh water from Northern California to Southern California along the West Branch of the California aqueduct. This has been estimated to be approximately 3,160 kwh/acre-foot. Total annual energy consumed (based on 6 working days) of the Calabasas Reclaimed Water Line would equal approximately 1,663,960 kwh/year.[1]

3.2.4 Other Alternatives Considered

Three other alternative route alignments have been considered. The basic objective of conveying reclaimed water from the existing balancing/storage reservoir at the LVMWD office to the Calabasas Park Golf Course remains the same, however, the differences in the alternatives are of route alignment.

Alternative A crosses the area in a more northerly alignment and is of a slightly greater pipeline distance. The pipeline would extend some 18,890 feet and would consist of 8,230 feet of a 14 inch force main and 10,660 feet of 14 inch gravity line. About 320 h.p. would be required for pumping at peak flow. The alignment extends from the existing reservoir northerly along Las Virgenes Road approximately 1/2 mile, then due east until it intersects with the proposed alignment of the extension of Parkway Calabasas at which time it follows the proposed road alignment (same as the Preferred Alternative at that point). A holding reservoir would also be utilized with this alternative and would be located at elevation 1,390, northeasterly of the proposed storage reservoir of the Preferred Alternative.
The total annual energy consumption for Alternative A is approximately 1,349,525 kwh per year.

Alternative B utilizes much of the alignment of Alternative A and retains its storage reservoir location. The route differs slightly in its western portion, in that it does not follow Las Virgenes Road. This route is slightly less in pipeline distance than the Preferred Alternative. The 14 inch pipeline would be approximately 17,390 feet in length and would consist of 6,730 feet of force main and 10,660 feet of gravity line. Pumping at peak flow would require approximately 320 h.p. and the total annual energy consumed would equal approximately 1,339,331 kwh/year.

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[1] Equivalent to electrical power consumption of approximately 252 residential units in one year.

Alternative D is the more southerly route and is the shortest alternative with a pipeline length of 16,540 feet. The pipeline would consist of a 14 inch force main of about 4,305 feet and a gravity line of about 12,232 feet. Pumping at peak flow would require approximately 420 h. p. This routing utilizes the same alignment of the Preferred Alignment along its eastern portion. The storage reservoir is to be located in close proximity to the storage reservoir of the preferred alternative but to the south and at a slightly higher elevation. Total annual energy consumption for this alternative is the highest of all four alternatives and is approximately 1,747,489 kwh/year.

All alternative routes enable reclaimed water to be utilized at the Calabasas Park Golf Course, however, Alternative C affords the greatest ability for reclaimed water useage by the proposed orchards of the Calabasas Park Subdivision. Alternative A and B, due to the lower storage reservoir elevation, cannot provide equivalent water pressure to the existing domestic water system and thus the system may not operate effectively. Alternative D, though the shortest route, requires the greatest power requirement.

A summary of the costs of each Alternative is as follows:

TABLE 43

Cost Summary of Reclaimed Water Line Alternatives

Alternative	Force Main	Gravity Main	Storage Reservoir	Pump Station	Right-of-Way	Engineering Legal and Contingencies	Total
A	$190,490	$223,860	$ 69,600	$128,000	$30,000	$189,127	$831,077
B	147,650	223,860	69,600	128,000	30,000	175,916	775,025
C	111,455	274,530	69,600	160,000	30,000	190,823	836,408
D	99,575	266,365	69,600	168,000	30,000	187.571	842,806

3.3 SEWAGE SOLIDS HANDLING ALTERNATIVES

The sewage solids handling alternatives all require certain common improvements to be made at the Tapia WRF. The plant would retain its aerobic digestion system and include the following improvements.

1. Revamping of the plant air systems.
2. Grit removal facilities, either prior to or subsequent to the influent pumps.
3. Expansion of the existing control building.
4. Installation of sludge screening facilities to remove plastic products.
5. Expansion of the aerobic digestion facilities to provide for sludge stabilization corresponding to 8 mgd wastewater flow.

These improvements would all occur within the immediate area of the Tapia WRF. The plant and its immediate area have been previously planned to be expandable and thus, these improvements would make use of the planned flexibility of the site and structures.

The present LVMWD practice of sludge disposal on private lands currently provides an economical solution for existing flows, but it must be noted that LVMWD has no direct control over the land disposal sites, nor of future fees to be charged by disposal site owners, and therefore, has no assurance of a continued viability.

The Draft AWFP had considered a number of alternative solids handling methods and a combination of alternatives dealing with alternate methods of pretreatment prior to transporation to sites, alternate methods of transporting sludge, alternate sites, alternative methods of sludge application to land, and alternatives for utilization of land after sludge application. The range of alternatives have now been narrowed by elimination of those alternatives related to production of edible crops. This has been done in anticipation of guidelines being considered by the State Department of Health which would effectively preclude use of sewage sludge for production of food crops. Thus, only those alternatives dealing with sod/forage crops, or disposal without crop production have been considered.

Based on general topography of the area and on contacts with property owners, it was determined that 3 sites were possible candidates for landspreading of sludge.

3.3.1 Location

One of the three areas being considered is referred to as the May Hunter Property and is located to the south and west of the intersection of Las Virgenes Road and Mulholland Highway. This land, however, has been recently condemned by the State of California to be included as part of the Malibu Creek State Park. All alternatives studied to date for this site have now been dropped. The other two sites include an area east of the intersection of Mulholland Highway and Las Virgenes Road known as the Ross Property and an area further to the north, on the east side of Las Virgenes Road known as the Sampo-Hope Property. These are shown on Figure 60. In addition to these alternate sites, the Calabasas Landfill, which has also been utilized by LVMWD, may also be considered an alternative. The landfill would also be utilized as a back-up site for all other alternatives during those wet weather periods which may preclude access to them.

3.3.2 Project Objectives

As previously discussed, the Tapia WRF has a design capacity of 8 mgd, but is limited to approximately 4 mgd since the solids handling portion and other minor facilities were constructed for only 4 mgd. At the present time, the flow at the plant exceeds the 4 mgd capacity of the solids handling system. This has caused concern over the ability of the District to effectively treat anticipated additional flows. At the present time, development of a number of residential units in the TCSD has caused an expected population increase of 38,000 to be projected within the next 10 to 15 years. Not only is this population increase beyond the present handling capability of the Tapia WRF, it is greater than the agreed TCSD share of the full 8 mgd design capacity of Tapia WRF when and if the projects being discussed in this report are implemented.

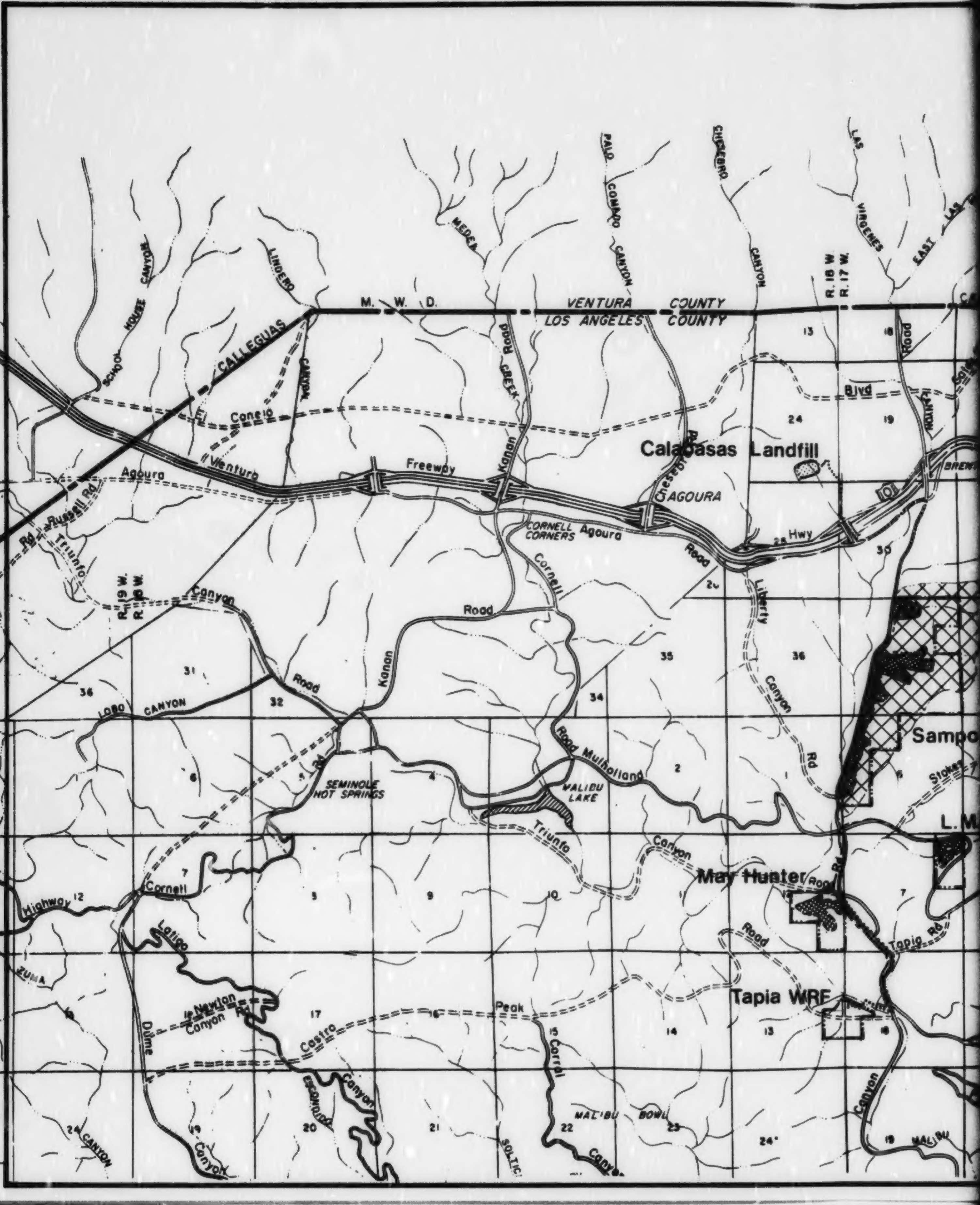
A symptom of the problem is indicated by the number of complaints voiced by local residents of odors emanating from the plant. This has required the use of another tank for a digester and the addition of another blower to treat additional flows, which are now approximately 4.2 mgd. This has temporarily alleviated the odor problem, but there still remains the issue of additional sludge to be disposed.

The present arrangement for sludge disposal is of great concern, as there is little that LVMWD can do if the present acceptors of sludge decide to raise fees for accepting the sludge or discontinue this practice. There is continuing pressure for urban development on much of the flat lands within the study area as well as acquisition by the State for park land. This tends to not only limit the ability of LVMWD to find areas for disposal of the sludge, but also causes greater amounts of sewage to be treated and more sludge to be disposed.

Thus, the objectives of the project is to expand the Tapia WRF to its full 8 mgd design capacity and establish a reliable means for disposal of the generated sludge. This would enable LVMWD to maintain its high level of treatment and meet the requirements of the RWQCB and accommodate the sewage treatment needs of its service area (to its 8 mgd capacity).

3.3.3 Preferred Alternative

The Preferred Alternative is to utilize the Sampo-Hope site as a sludge farm. The alternative will require the acquisition of approximately 560 acres of which 120 acres can be utilized for injection of stabilized sludge and growing of sod-forage crops. The stabilized sludge (2% solids) is to be pumped from the Tapia WRF to the Sampo-Hope site, where it would be held in covered, aerated holding tanks (3-150,000 gallon tanks depending on 1977 volume or 1997 volumes. The 2% solids stabilized sludge is the recommended proportion since it is less expensive to pump a lighter and more liquid slurry to the disposal site, and it negates the necessity to use heavy duty pipes or pumping mechanisms. A heavier solids mixture could also decrease the total life expectancy of the pipeline. In order to minimize hydraulic loading at the site and reduce manpower requirements for sludge injection, the 2% sludge would then be concentrated to about 4% solids using a dissolved air floatation thickener and held in a 4 day retention time storage facility. A tank truck equipped with injection equipment would load the liquid sludge from the storage tank and inject the sludge into the soil at a uniform rate to a depth of approximately 6 to 8 inches. This injection would take place on an 8 hour per day, 5 day per week basis. Sod-forage crops would be grown on areas that have been injected on a rotational basis. Crop harvesting would be staggered so that sludge injection could proceed on a daily basis throughout the year, and storage would be required only to provide for weekend production.


SCHOOL HOUSE CANYON
LINDERO CANYON
MEDEA CREEK
PALO COMADO CANYON
CHESEBRO CANYON
LAS VIRGENES
EAST LAS
R. 18 W.
R. 17 W.
CALLEGUAS
M. W. D.
VENTURA COUNTY
LOS ANGELES COUNTY
Kanan Road
El Conejo
Blvd
Ventura Freeway
Agoura
Russell Rd
Triunfo
R. 19 W.
R. 18 W.
Calabasas Landfill
Chesebro Rd
AGOURA
101
CORNELL CORNERS
Agoura Road
Hwy
Cornell
Liberty Canyon Rd
Canyon
Road
Kanan
LOBO CANYON
Road
SEMINOLE HOT SPRINGS
Mulholland
MALIBU LAKE
Triunfo Canyon
Sampo
L.M.
Stokes
May Hunter
Road
Tapia Rd
Tapia WRF
Highway
Cornell
Latigo
ZUMA
Dume
Newton Canyon Rd
Castro Peak
Corral
ESCONDIDO
Canyon
MALIBU BOWL
SOLTICE
CANYON
Canyon
Canyon
MALIBU
13
18
24
19
20
30
31
32
34
35
36
36
2
1
6
4
5
6
7
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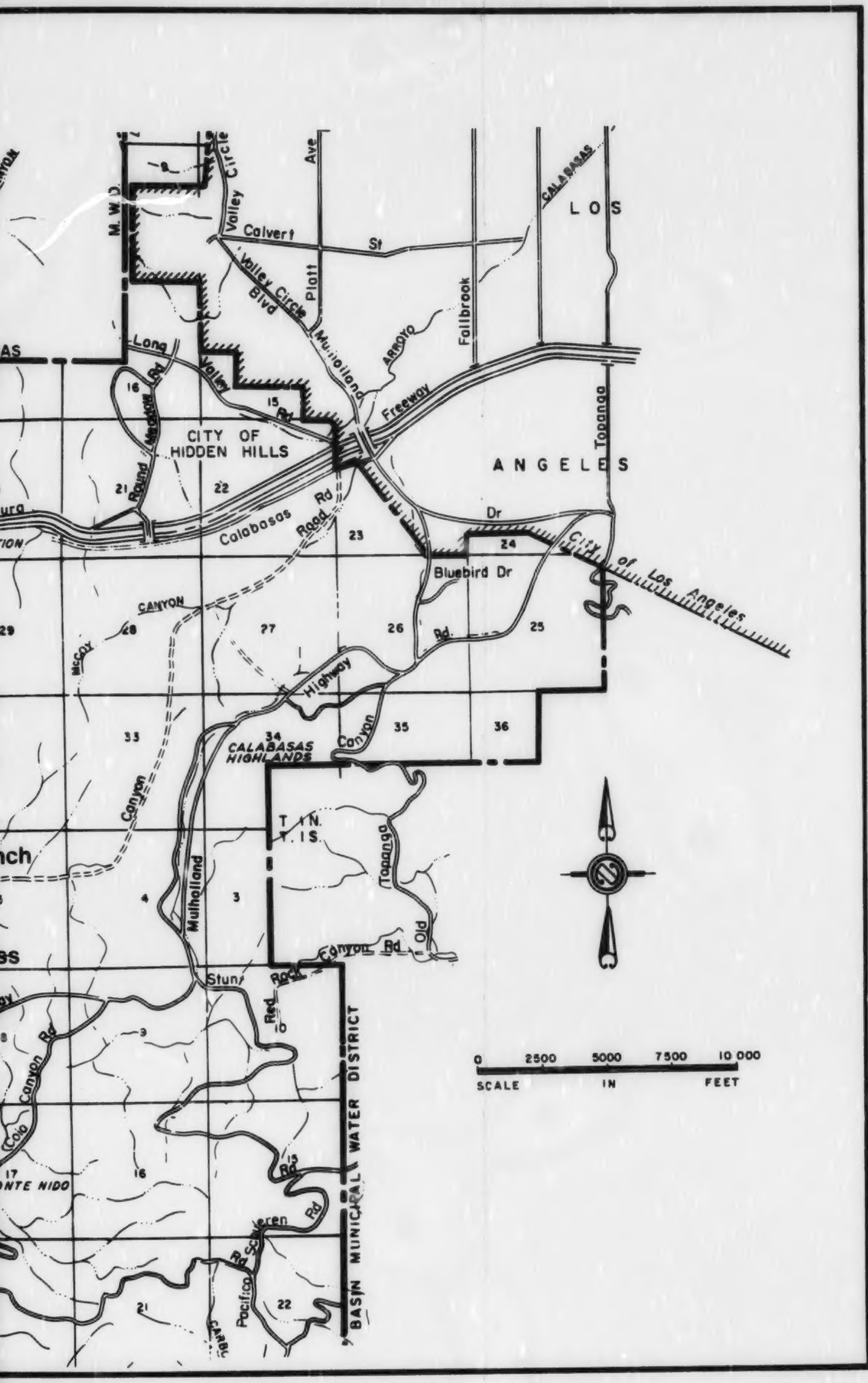
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Calabasas Rd
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Bluebird Dr
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McCOY
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Highway
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SCALE IN FEET

EIS/EIR

Las Virgenes-Triunfo
Malibu-Topanga
Area Wide Facilities Plan

legend

landfill	▨
treatment area	●
truck route	···········
pipeline	— - —
alternative pipelines	— - - — - - - -
watershed limits of sampo ranch	☒

North

sludge disposal site

fig.60

3-9-A

With approximately 120 acres of useable area, the projected application rate during a 20 year planning period would be as follows:

Year	T/day (Dry Basis)	T/ac/yr. (Dry Basis)
1977	4.0	12.2
1987	5.6	17
1997	6.5	19.8

The Regional Water Quality Control Board would require that land disposal of stabilized sludge be developed in a manner that protects both surface and groundwaters from pollutants. Thus, surface drainage of the area would be controlled so that all runoff, offsite and upstream of the site, would be diverted around the site and all water on-site would be retained without leaching. This would be accomplished by development of runoff collectors and diversion channels to direct stormwater runoff around the site and also development of a cut-off ditch to intercept any leachate and return it to the headworks of the treatment plant. This system would be monitored to assure no contamination of surface or groundwaters by runoff or leachate. The RWQCB further requires that application should not result in odors or nuisance and that sludge be covered or mixed thoroughly with the soil. Ponding would also be prohibited. The injection method of application would conform to these requirements.

The preferred alternative would continue to rely on the Calabasas Landfill as a back-up site for disposal of sludge if it were not possible to utilize the proposed sludge farm system at any time. This situation might occur during an extensive rainy period causing fields to be so muddy that a tank truck would not be able to be utilized, or during the event of an extended power failure, or breakdown of pumps or pipeline.

Estimated annual costs and present worth for this alternative are listed on Table 44.

3.3.4 Other Alternatives

Other alternatives which have been considered include:

- Year-round use of the Calabasas Landfill as a sludge disposal site, and

- Sludge disposal at the Ross Property (no crop farming)

Use of the Calabasas Landfill would involve the trucking of stabilized sludge to the landfill and adding facilities at the Tapia WRF to provide for the increased quantities of sludge. This would consist of the treatment of stabilized sludge with a polymer prior to dewatering in dual cell gravity units and roller presses to enable thickening of sludge to a 20% solids content. Any excess water from the system would be returned to the main lines of the plant, and entered into the reclaimed water system. The 20% solids content enables the system to economize on truck loads to Calabasas and on disposal fees (fees are set by load, not weight).

Because the landfill will only accept waste materials on a seven hour per day basis, it would be necessary to transport sludge within this time period. In order to maintain this type of delivery schedule, it is estimated that a total of 5 DCG's and 4 roller presses would be required and two full-time operators needed to handle operations and deliveries.

Estimates of annual cost and present worth for this alternative are listed on Table 45.

Sludge disposal at the Ross Property involves pumping of stabilized sludge (2% solids) to the Ross Property, storage in covered, aerated holding tanks (3-150,000 gallon tanks), thickening from 2 to 4% using a dissolved air floatation thickner, and four day retention time storage facility. A tank truck with injection equipment then would proceed to inject the sludge at a uniform rate at a depth of approximately 6 to 8 inches. Injection would be accomplished on an eight hour per day, five day per week basis.

The Ross Property is approximately 68 acres, but it has a useable area of about 34 acres. For this reason loading rates are considerably higher than the Sampo-Hope Property which has a larger useable area. The rates for the Ross Property are:

Year	T/day (Dry Basis)	T/ac/yr. (Dry Basis)
1977	4.0	42.9
1987	5.6	60.1
1997	6.5	69.7

TABLE 44

ESTIMATED ANNUAL COST AND PRESENT WORTH
SAMPO-HOPE PROPERTY; SOD/FORAGE CROP ALTERNATIVE*

ANNUAL COST

ANNUAL CAPITAL COSTS:	
At treatment plant site:	
Sludge holding facilities ($73,000; 20 yrs.)	$ 6,890
Pumping station ($118,000; 20 yrs.)	11,140
Back-up sludge dewatering system ($434,700; 20 yrs.)	41,040
Pipeline to landspreading site:	
Force main and appurtenances ($865,000; 40 yrs.)	71,110
At landspreading site:	
Sludge holding facilities ($992,000; 20 yrs.)	93,650
Sludge thickening facilities ($518,000; 20 yrs.)	48,900
Thickened sludge storage ($196,000; 20 yrs.)	18,500
Sludge injection truck ($70,000; 5 yrs.)	18,780
Site improvements ($30,000)	2,100
Monitoring and extraction wells ($20,000; 20 yrs.)	1,890
Site ($1,911,400 @ 7%)	133,810
Total	$ 447,810
ANNUAL OPERATING COSTS:	
Injection Truck	$ 31,300
Operation	31,300
Maintenance	50,000
Power	31,200
Fuel	3,800
Agricultural operation ($154/acre)	18,500
Agricultural income ($321/acre)	-(38,500)
Total	$ 127,600
TOTAL ANNUAL COST	$ 575,410
PRESENT WORTH	$6,095,420

*Based on 1987 projections (an average during the 20 year planning period).

TABLE 45

ESTIMATED ANNUAL COST AND PRESENT WORTH CALABASAS LANDFILL ALTERNATIVE*

ANNUAL COST

ANNUAL CAPITAL COSTS:	
Solids concentration, building modification ($15,500; 4 yrs.)	$ 1,270
Dual cell gravity units ($229,700; 10 yrs.)	27,290
Sludge pumping ($53,800; 20 yrs.)	5,080
Dewatered sludge conveyors ($37,500; 20 yrs.)	3,540
Dewatered sludge storage ($74,000; 20 yrs.)	6,990
Roller press ($226,800; 10 yrs.)	26,940
Piping, electrical and miscellaneous ($37,600; 20 yrs.)	3,550
Disposal vehicle ($35,000; 5 yrs.)	9,390
Total	$ 84,050
ANNUAL OPERATING COSTS:	
Operation	$ 62,500
DCG and roller press maintenance	56,000
Pumps and miscellaneous maintenance	7,000
Chemicals (2,050 T @ $30/T)	61,300
Power	3,800
Fuel	1,000
Dumping fees (2,050 T/.20 x $3.50/T)	35,800
Total	$ 227,400
TOTAL ANNUAL COST	$ 311,450
PRESENT WORTH	$3,299,430

*Based on 1987 projections (an average durind the 20 year planning period).

It should be noted that acceptable sludge loading rates for agricultural crops have generally been estimated to be approximately 10 to 20 dry tons per acre per year. The necessary higher sludge loading rates for the Ross property would thus not permit consideration of farming.

The alternative would also utilize diversion channels to divert stormwater runoff to preclude contamination of surface waters. A cut-off ditch would also be utilized to intercept any leachate and return it to the headworks of the treatment plant. This system would be monitored to assure that any possibility of contamination of surface or groundwaters by runoff or leachate be dealt with prior to its occurrence. Calabasas Landfill would also be considered as a back-up for this system.

Estimates of annual cost and present worth for this alternative are shown in Table 46.

3.3.5 Comparison of Alternatives

Although the Preferred Alternative is the costliest alternative, it is preferable for a number of reasons. The use of the Calabasas Landfill incurs the highest annual operating costs due to the annual dumping fees charged for use of the landfill site and the chemicals needed to meet sludge disposal requirements at the landfill. The dumping fees are beyond the control of LVMWD and are subject to change. Disposal at the landfill could also be considered a waste of the sludge and would not permit any beneficial use to be gained from the sludge. The landfill alternative, however, has the lowest capital cost and has the advantage that it is not constrained by wet weather condition.

The alternative of the Ross Property, though substantially lower in total monetary cost, is constrained by the limited amount of useable area available. It would also not permit crops to be grown and would thus be considered a disposal operation. A number of environmental factors also make the alternative less desirable and are described in the following chapter.

TABLE 46

ESTIMATED ANNUAL COST AND PRESENT WORTH ROSS PROPERTY; NO CROP ALTERNATIVE*

ANNUAL COST

ANNUAL CAPITAL COSTS:	
At treatment plant site:	
Sludge holding facilities ($73,000; 20 yrs.)	$ 6,890
Pumping station ($118,000; 20 yrs.)	11,140
Back-up sludge dewatering system ($434,700; 20 yrs.)	41,040
Pipeline to landspreading site:	
Force main and appurtenances ($658,000; 40 yrs.)	54,090
At landspreading site:	
Sludge holding facilities ($496,000; 20 yrs.)	46,820
Sludge thickening facilities ($259,000; 20 yrs.)	24,450
Thickened sludge storage ($98,000; 20 yrs.)	9,250
Sludge injection truck ($70,000; 5 yrs.)	18,780
Site improvement ($15,000)	1,050
Monitoring and extraction wells ($9,000; 20 yrs.)	850
Site ($300,000 @ 7%)	21,000
Total	$ 235,360
ANNUAL OPERATING COSTS	
Operation	$ 31,300
Maintenance	50,000
Power	30,800
Fuel	3,800
Injection truck operation	31,300
Total	$ 147,200
TOTAL ANNUAL COST	$ 382,560
PRESENT WORTH	$4,005,000

* Based on 1987 projections (an average during the 20 year planning process).

TABLE 47

COST OF COMPARISON OF ALTERNATIVES

ALTERNATIVE	CONSTRUCTION COST*	ANNUAL CAPITAL COST	ANNUAL OPERATING COST	TOTAL ANNUAL COSTS	PRESENT WORTH
Calabasas Landfill	$ 709,900	$ 84,050	$227,400	$311,450	$3,299,430
Ross Property	2,530,700	235,360	147,200	382,560	4,005,000
Sampo-Hope (Sod/Forage Crop)	5,258,100	447,810	127,600**	575,410	6,095,420

* Total construction costs, August, 1977.

** Includes credit for net annual income from crop.

4.0 Direct Impacts of Alternatives

4.0 DIRECT IMPACTS

4.1 INTRODUCTION

This section will deal with the direct impacts of the Calabasas Reclaimed Water Line and the sludge handling alternatives as they relate to construction and operation of these proposed projects.

Construction and operation impacts associated with the Calabasas Reclaimed Water Line will be addressed first, followed by a discussion of direct impacts of the sludge handling alternatives. Only those items which are impacted will be discussed.

The focus of the impact analysis is on the two preferred alternatives: Alternative C of the Calabasas Reclaimed Water Line, and the Sampo-Hope site for sludge farming. Both the Reclaimed Water Line and the sludge disposal alternatives will induce some construction and operation related impacts that will be mitigated to the greatest extent possible by the appropriate entity (see Chapter 7).

The concerns described in the text of this Chapter for the Calabasas Reclaimed Water Line are: ground shaking in the area that could cause the pipe and reservoir to rupture (special design of the system can offset any significant impact); possible loss of trees in oak woodland savannah (measures can be taken to mitigate impacts); visual impact if the pipe is located at or above grade; potential disruption to an archaeological site (can be mitigated by careful construction techniques); and total annual energy consumption of the project.

The primary concerns associated with the sludge farming operation at the Sampo-Hope site include: a potential odor problem during wet weather (trucking the sludge to Calabasas Landfill in wet weather will eliminate this concern); potential runoff from surrounding hills to site (off-site diversion potential contamination of crops due to heavy metals or pathogens (amounts of cadmium are low and will have no effect on humans since food chain is not directly impact); chemical and physical make-up of the soil will change (but would not be completely detrimental); disturbance could cause obnoxious weed species (farming operation will control growth of weeds); storage tanks will be visually disruptive (screening and vegetation could be utilized to "soften" tank views); an archaeological site occurs near a sludge application area (sludge application will not occur directly to the site due to physical landform constraints); and energy consumption of the project.

4.2 DIRECT IMPACTS OF CALABASAS RECLAIMED WATER LINE

4.2.1 Air Quality Impact

- Construction Impacts

  The primary impact from the proposed project would be direct construction related impacts. These impacts would involve exhaust emissions from construction vehicles and dust generated during earth work. The emission and generation of air pollutants would be short-term and should not be of significance. The emissions from construction vehicles would be extremely minor, whereas dust would be localized and controlled by proper abatement measures.

4.2.2 Groundwater

The project area includes parts of the Las Virgenes Creek watershed area on the west and parts of the McCoy Canyon watershed area to the east. No extensive aquifer or groundwater storage areas are crossed by the pipeline alignment. The alluvial deposits in the valley east of the elevated reservoir and in McCoy Canyon are thin and only absorb minor amounts of water after periods of intense rainfall, thus not storing important quantities. No wells exist along the alignment, and no major seeps or springs were observed.

- Construction Impacts

  No dewatering of trenches is generally anticipated, since there are no known shallow groundwater bodies in the area. However, groundwater could be encountered in small quantities in crossings of small drainages. Anticipated quantities could easily be handled by a portable pump. No impacts are anticipated on groundwater conditions of the area due to operation or maintenance of the project facilities.

4.2.3 Geology, Seismicity, and Soils Impacts

The preferred pipeline alignment starts approximately at Elevation 800 at the effluent storage reservoir located behind the headquarters of the Las Virgenes Municipal Water District. From the reservoir eastward, the pipeline would be laid in slopewash materials, and in sandstone bedrock of the Middle Miocene Topanga Formation to about Elevation 1250.

Hard, well cemented, locally conglomeratic, sandstone outcrops of the Topanga Formation occur on the ridge immediately north and east of the storage reservoir. The pipeline alignment avoids most of these outcrops and follows the top of the roughly east-west ridge underlain by less resistant, friable, light colored sandstone beds which generally strike northerly and dip easterly, into the mountain side.

From Elevation 1250 upslope to the intersection with a northwest-trending ridge, and along this ridge to the site of the proposed reservoir at Elevation 1536, the alignment is underlain by hard siliceous shale of the Upper Miocene Modelo Formation. The shale is predominantly laminated, thin bedded, and weathers to a light gray color. The Modelo Formation also contains siltstone and hard limestone beds.

In the immediate vicinity of the reservoir site, the underlying rocks consist mainly of thinly bedded siltstone and shale with minor amounts of fine grained sandstone. These beds strike north-northwest and dip easterly between 25 and 55 degrees (R. Stone and Associates, 1972).

From the reservoir to the valley to the east, the pipeline alignment is underlain by sandstone and siltstone units of the Modelo Formation. The alignment follows the ridge immediately east of the reservoir site and then a road (Mine Road) which leads to the bottom of the unnamed valley which joins McCoy Canyon farther downslope.

In the valley, the pipeline alignment is underlain by alluvial deposits consisting of clayey to silty and gravelly sand.

Immediately north of the confluence of the unnamed valley followed by Mine Road and McCoy Canyon, the alignment swings northeastward over a low saddle, west and north of a round peak, and then follows the road to the west end of Calabasas Golf Course. Most of this part of the alignment is underlain by generally massive, friable, medium grained, tan to orange-brown sandstone with some thinly bedded shale. In a few places along the alignment, which follows the proposed access road to Calabasas Park subdivision, the alignment lies in artificial fill consisting mainly of uncompacted soils placed over creek crossings.

Slope Stability

Several areas in the vicinity of the proposed pipeline alignment are underlain by landslide deposits. Most of these are old and obscured by weathering and erosion (B. Leighton and Associates, 1976, 1977). No landslides are known to occur along the proposed alignment. However, there is one area which has a suspicious geomorphic expression and which could correspond to an old landslide. This area is located immediately below the top of the ridge approximately 400-500 feet east of the ridge reservoir. However, Alignment C has been designed to bypass the area.

Shallow slope failures such as soil slumps, mud slices or debris flows, affect the steeper slopes in the project area. These are activated usually during periods of prolonged rainfall. No shallow slope failures have been identified along the alignment.

A common phenomenon in most steep areas is soil and rock creep which consists of the slow downslope migration of the soil mantle and loosened shallow rock outcrops. Creep was observed on the steeper hillsides traversed by the pipeline alignment in the vicinity of the ridge-top reservoir. However, appropriate engineering methods can resolve any creeping that would occur as a result of construction of the pipeline.

Other Geologic Hazards

No active faults cross Alternative C so that no ground rupture is expected from fault movement.

No liquefiable soils have been identified along the alignment.

Since the alignment is not near the ocean and there are no lakes along it, there is no tsunami or seiche hazard.

No land subsidence due to extraction of groundwater, gas, oil or to hydrocompaction are known to occur in the area, and none are expected.

There are no volcanic hazards in the area. The nearest known volcanic center with Quaternary activity is more than 100 miles away and poses no threat to the project.

Soils

The soils underlying the alignment are thin and rocky along ridges and on steep hills. They are thicker and clayey, silty or sandy in lower, gentler sloping, alluviated areas. The soils are sandy where derived primarily from sandstone, and clayey and silty where derived from shale and siltstone, respectively. Rock fragments are common near the base of the soil profile and the transition with underlying bedrock. The clayey soils are moderately expansive in general.

The soil types along the alignment, according to Soil Conservation Service mapping (1967), are the following:

CAF2:	Calleguas and Arnold loamy sand 30 to 50 percent slopes, eroded, 0 to 16 inches thick, moderately expansive.
CtEl and CtD2:	Castaic silty clay loam, 9 to 30 percent slopes, eroded, 0 to 36 inches thick, moderately expansive.
MhF:	Millsholm loam, 15 to 50 percent slopes, 0 to 16 inches thick, moderately expansive.
SR:	Sedimentary rock land, over 25 percent rock outcrop, 0 to 10 inches of soil with variable textures and consistence, on hard sandstone, shale and conglomerate.

- Construction Impacts

  The construction of the proposed pipeline would have only minor effects on the soils and geologic conditions of the area, and none on the seismologic conditions. Conversely, geologic and seismologic conditions can have an impact on the proposed pipeline such as if an earthquake were to occur during the construction period.

  Most normal surface construction activities associated with the development of the pipeline, particularly trenching and access road construction, would disturb soils and rock outcrops, and would increase erosion to a slight degree, especially if intense rainfalls occur during construction. Soils in the area are not used for agricultural purposes other than grazing, and construction impacts would not be intense. Soil structure and physical properties would be different after construction and could result in increased erosion susceptibility and sediment yield; and changes in surface runoff, permeability, and infiltration. This effect can be minimized by proper compaction of trench backfill materials, and by revegetation as necessary.

A special problem is presented in areas where the pipeline alignment lies parallel to the slope of steep hillsides. If the pipeline is buried in a trench, extensive cuts may be required to provide access to construction equipment and to bury the pipe to sufficient depth to protect it from displacements due to shallow slope failures or to soil and rock creep. Such cuts would require special geotechnical analysis and design to insure their stability.

Material excavated from these cuts could be used as fill in the planned subdivision roads, or could be disposed of otherwise. An alternative to burial of the pipeline is to place it on the surface of the ground and anchor it to bedrock with rock bolts, or by some other means. This alternative would cause minimal impact on soils and geologic conditions, since there is minimum soil or rock disturbance.

The alignment in the gently sloping, alluviated valley crosses thin soils containing moderately expansive clays. Appropriate design provisions would eliminate the shrink-swell hazard that could cause undesirable stresses from horizontal and vertical displacement of the pipe.

Trenching difficulties are anticipated along the steeper slopes of the alignment and in areas of hard bedrock outcrops. The main difficulties are expected between the storage reservoir at Las Virgenes Municipal Water District and the ridge immediately east of the balancing reservoir at Elevation 1536. Access will be difficult for construction equipment on steep slopes. Hard bedrock outcrops, such as some sandstone beds of the Topanga Formation in the vicinity of Las Virgenes Municipal Water District headquarters, and some siliceous shale and limestone beds of the Modelo Formation on steep slopes and along ridges, may require drilling and light blasting.

No trenching difficulties are anticipated in the alluvial deposits nor in the gentler sloping, soft bedrock areas along Mine Road and McCoy Canyon. Excavation rates will be affected mainly by type of materials to be excavated. No drilling or blasting is anticipated in these areas.

The proposed reservoir at Elevation 1536 would be excavated entirely in siltstone, shale, sandstone, and limestone of the Modelo Formation. Construction of this reservoir will cause disturbance of the thin rocky soil cover and of bedrock. Specific construction plans for the reservoir have not been developed; however, it is anticipated that heavy ripping, drilling, and blasting will be required. The excavated material will most probably not be used as side-hill fills but will be disposed of in some other safe and economical manner such as roadfill.

The reservoir will be lined to prevent infiltration into underlying bedrock and to prevent seepage.

Cut slopes in bedrock will vary between 1:1 and 1.75:1 and would be stable.

No excessive erosion of the hard sandstone, siltstone, and limestone is expected. Shale is relatively soft and may require protection to prevent ravelling and gullying during intense rainfall periods.

Although the probability of strong ground shaking due to a nearby earthquake is very low during the construction period, such an occurrence would have some undesirable effects. Open trenches could experience wall collapse along unsupported stretches; unfinished steep cut slopes could experience rock falls or sliding problems; and uncompacted fill could experience differential settlement. No liquefaction is expected to affect the project, since there are no known saturated, liquefiable granular soils along the pipeline alignment.

- Operation Impacts

  No impacts on the soils, geologic, and seismologic conditions are expected from normal operation and maintenance of the project.

  The major hazard of impacts would be derived from the occurrence of a large earthquake in the vicinity that causes strong ground shaking in the project area. Strong ground shaking could produce leaks on weak pipe joints. These leaks could go undetected and could reduce the stability of some hillside slopes causing small mud slides or debris flows.

  Ground shaking along narrow ridges is sometimes more intense than in rolling terrain or flat areas. The pipeline alignment is in bedrock near or along narrow ridges for a length of approximately 2,000 feet and would be subject to this intense ground shaking in the event of an earthquake. The storage reservoir at Elevation 1536 would also be affected by this shaking. Special design considerations and construction provisions would be applied to prevent rupture of the lining in the reservoir and consequent seepage, and to avoid pipeline rupture.

  No impacts are anticipated on soils of the area from normal operation and maintenance of the pipeline system. Should there be rupture of the pipe and/or of the storage reservoir, flow of reclaimed water could cause erosion of the soils near the point of rupture. Repairs could be made fast enough to prevent major damages.

  Surface runoff occurring naturally during and after rainfall periods would not be affected by the proposed project. If the backfill of the pipeline trench is not properly compacted and stabilized, surface runoff could erode it or infiltrate into the trench and move along it to low lying areas where water would emerge as springs.

4.2.4 Biota Impacts

Four biotic communities can be found along the Alternative C alignment. These include cismontane introduced grassland, coastal sage scrub, mixed chaparral, and southern coastal oak woodland. In addition, ruderal vegetation (weeds introduced where natural cover has been disturbed) can be found along existing roadsides. However, due to their small size, these areas have been lumped with the grassland community.

The Study Area has been impacted by grazing and much of the vegetation is in poor condition. Following is a description of the natural and man-created biotic communities found along the corridor. The community classification is based on that proposed by Cheatham and Haller (1975). Lists of the floral and faunal species observed and expected along the study corridor are provided in the Appendix.

Cismontane Introduced Grassland

The most common community in the Study Area is cismontane introduced grassland. It is found over nearly all of the western two-thirds of the route. This vegetation has replaced native grasslands and coastal sage scrub in most low elevation valleys and foothills in cismontane Southern California. It is commonly found in fine textured clay-bearing soils that are water logged during the winter rainy season, and are very dry during the summer and fall. At the study site, cismontane introduced grassland has been maintained by grazing. Gentle hillside and valley areas were probably once native grassland whereas steeper hillsides were probably coastal sage scrub.

The flora of this community is dominated by annual grasses and forbs that grow 0.2 to 1.0 meter high. These include wild oats (Avena fatua), Ripgutgrass (Bromus diandrus), foxtail chess (B. rubens), black mustard (Brassica nigra), and red-stemmed filaree (Erodium circutarium). These are non-natives and are considered to be "weedy" species. Frequently associated with these are native wildflowers including owl's clover (Orthocarpus sp.), lupine (Lupinus sp.), fiddleneck (Amsinckia intermedia), and California poppy (Eschscholzia californica). The vegetative cover of this community characteristically germinates during the late rainfall, and grows and flowers from winter through spring. Plants then die and persist as seeds through summer and fall.

Large open expanses of grassland support a limited abundance and diversity of wildlife. However, where this community borders brush or woodland habitat, such as it does on the study site, it can be very valuable to wildlife as a foraging area. Only one amphibian species is expected in this dry habitat. It is the western spadefoot toad. This species can survive there because of its burrowing behavior and physiological adaptations to conserve body water. Reptiles are represented by several snake species, the coast horned lizard, western fence lizard, side-blotched lizard, and western whiptail lizard.

The mammalian fauna found in this type of habitat is composed of small rodents, Beechey ground squirrel, Botta pocket gopher, Audubon's cottontail, and several other medium to large mammals that forage here. Two groups of birds dominate the avian fauna in this community. Grassland birds such as the western meadowlark, water pipit, savannah sparrow, lark sparrow, and horned lark forage for seeds and insects on the ground. Several of these species will nest here if not disturbed. The second group of birds are the predators. These species are expected to include the golden eagle, red-tailed hawk, marsh hawk, white-tailed kite, turkey vulture, American kestrel, great horned owl, barn owl, and screech owl. For these organisms, old fields serve as important feeding grounds. However, they depend on adjoining southern oak woodland habitat for nesting and perching sites.

Coastal Sage Scrub

Coastal sage scrub is the characteristic plant community on the hillsides and ridges of the dry foothills of coastal and cismontane Southern California. This habitat has been continually removed by man for agricultural and urban expansion, and is rapidly decreasing in availability, especially in Los Angeles.

Within the study corridor, coastal sage scrub habitat is present on several hillsides bordering the preferred pipeline route. These include hillsides and ridges near the reservoir site, and on south-facing slopes near the golf course and the intersection of the alignment and Warner Brothers Road. These areas have been impacted by grazing and cattle trails are common, but most habitat remains in fair to good condition.

The dominant shrubs at the project site include California encelia (Encelia californica), gray coast eriogonum (Eriogonum cinereum), California sagebrush (Artemisia californica), deer weed (Lotus scoparius), and black sage (Salvia mellifera). Larger more robust species such as Laurel sumac (Rhus laurina), toyon (Heteromiles arbutifolia), and elderberry (Sambucus mexicana) can be found on open hillsides but are more common in drainages. Groundcover species are dominated by annual grasses and forbs introduced by man through grazing. These include black mustard, redstemmed filaree, wild oats, and fox-tail chess. In addition, several native forbs were present including indian paintbrush (Castilleja sp.), Mariposa lily (Calochortus sp.), lupine, owl's clover, California poppy, and blue-eyed grass (Sisyrinchium bellum).

Coastal sage scrub supports a surprising diversity of wildlife. Large, wide-ranging mammals such as mule deer, bobcat, and coyote are expected to utilize this habitat within their range.

Small rodents such as the deer mouse, Pacific kangaroo rat, Beechey ground squirrel, and Botta pocket gopher are usually common as are medium sized mammals including the black-tailed hare and Audubon cottontail. Several snake and lizard species can be found in this habitat, however, amphibians are generally absent. Common bird species found in this community include brown towhee, several sparrow species, California thrasher, bewick's wren, and roadrunner. Many other small birds are common in the winter. Predatory birds are commonly seen soaring overhead. These species roost and nest in nearby oak woodland habitat.

Mixed Chaparral

This community occurs primarily on north-facing slopes bordering the central and eastern portion of the proposed alignment. Chaparral species commonly grow six to ten feet high and often form dense nearly impenetrable stands. The vegetation on the study site is much more open at the current time due to a fire that passed through the area within the last ten years. However, given time, it will regenerate to a dense shrub cover.

Dominant species at the study site include lauren sumac, mesa bushmallow (Malacothamnus fasciculatus), chamise (Adenostome fasciculatum), and buck brush (Ceanothus cuneatus). Other common species include black sage, scrub oak (Quercus dumosa), our Lord's candles (Yucca whipplei), and California encelia.

Southern Coastal Oak Woodland

This oak woodland community is typically found on northfacing slopes and in canyon bottoms that possess deep moist soils and are protected from fire. It commonly grades into scrub habitats in drier areas. Most of the eastern two-thirds of the proposed pieline passes through or very near oak woodland habitat (see Figure 35).

This habitat is dominated by coast live oaks (*Quercus agrifolia*) twenty to fifty feet tall. Valley oak (*Q. lobata*) is also present, but is much more uncommon. The understory vegetation consists primarily of grasses including wild oats, foxtail chess, and ripgut. A thick leaf litter is also present in many areas.

Oak woodland is an important wildlife habitat. The added dimension of large trees supports a high diversity of animal life. This is enhanced by its interface with surrounding vegetation types and most species found in adjacent vegetation types can be found here.

Amphibian populations are supported beneath the moist leaf litter and along stream banks while reptiles are common in the understory vegetation and groundcover. Many mammals also reside in this habitat. Oak woodland is extremely important to bird species. In addition to species from adjacent habitats, this community supports others that require the moist vegetation and/or trees. Hummingbirds, woodpeckers, many flycatchers, thrushes, vireos, warblers, and many finches forage and nest in this habitat. Many migratory species utilize this habitat for cover and as a feeding area as they move through in the fall and in the spring. Hawks, owls, falcons, kites, and doves specifically require the trees as perching and nesting sites. Some predatory species, such as Cooper's hawk and sharp-shinned hawk forage strictly in woodland habitats. Others feed in surrounding vegetation and help control rodent populations.

At the study site, this habitat has been heavily impacted by over-grazing. The soil is disturbed by numerous cattle trails and the understory vegetation is sparce. In addition, grazing cattle are consuming oak seedlings and are preventing recruitment of new trees. However, many large healthy oaks remain. Despite its disturbed condition, the area is expected to support a diverse vertebrate fauna and to possess the potential to support many more. If left alone to restore itself, this area would be valuable wildlife habitat. However, the development of a residential subdivision/orchard (which has recently been approved for development) at the study site will not allow this to occur.

Unique/Limited Resources

No rare, endangered, or threatened plant or animal species were observed, or are expected to occur in the study corridor. However, the proposed pipeline route does pass through property that has been identified as ecologically valuable in the Los Angeles County 1976 Significant Ecological Area Study. The boundaries of this area, known in the study as Palo Comado Canyon, are shown on Figure 36. According to the 1976 study, this area represents one of the last examples of southern oak woodland savannah of any significant size in Los Angeles County. Once widely distributed, this habitat is now restructured in distribution due to urban and agricultural expansion. In addition, the report states that despite its disturbed condition, the woodland supports an abundant population of raptorial birds and woodpeckers, and that the western gray squirrel is found in the area. The area is also important to large mammals and grassland bird species, particularly migratory and wintering populations.

- Construction Impacts

  The proposed pipeline project will directly remove existing vegetation. According to project engineers at Boyle Engineering and the Las Virgenes Municipal Water District, construction activities will generally be limited to a twenty to thirty foot easement. This easement will include access roads. Additional areas may be impacted through cut and fill operations and stockpiling activities. These will be greater on steep hillsides and will create potential erosion hazards. There are no significant habitat areas where these operations will take place. However, as additional development of the region takes place (i.e., Calabasas Parkway subdivision/orchard), erosion problems here may contribute to the degradation of important oak woodland habitats "downstream" through increased runoff volumes and velocities, increased siltation rates, and alteration of natural drainage patterns.

  If the Alternative C alignment is followed, construction is not expected to directly remove any significant wildlife habitat. However, the pipeline may indirectly destroy trees where it passes through valuable oak woodland savannah. Native oaks do not tolerate changes once mature. Substantial changes in their environment will weaken and/or kill healthy oaks. Construction activities within oak woodland habitat may destroy oak trees in this manner, especially if the soil between the dripline (the area within the maximum circumference of the foilage) and the trunk of a tree is disturbed. Oak trees may be destroyed through trenching activities which sever significant portions of root systems or through extensive pruning for clearance.

Earthmoving or other heavy equipment may compact soil beneath trees. This will inhibit essential gas exchange between roots and the atmosphere, and it will restrict water movement into the root zone. This will result in the eventual loss of trees. Stockpiling beneath trees may also result in soil compaction or it may have an opposite effect by trapping excessive moisture which may cause root crown rot.

During the construction period, the project will disturb wildlife populations in adjacent coastal sage scrub, chaparral, and oak woodland habitats. The presence of man, machinery, and noise will cause many less tolerant species to leave nearby habitat areas. This is particularly true of large mammals and predatory birds. However, these species should return after construction.

There may be a short-term increase in the potential for fire hazards during the construction period. This would be especially true during the summer months after a dry winter when the vegetation in the study area is highly volatile. However, measures can be taken to decrease the potential for accidental fires.

4.2.5 General Scenic Quality

The steep topography, confined valley, and natural vegetation combine to create a highly attractive visual quality. Views from ridge tops are especially impressive as panoramic views toward the San Fernando and Las Virgenes Valley can be seen. Within the valleys, the views are confined by the surrounding hills and made more pleasurable by groups and individual oak trees. From the exterior, the hillsides at the west end of the project area are visible from portions of Las Virgenes Road, Rondell St., and the Ventura Freeway. Due to the present undeveloped nature of the area, the central and eastern portions (excluding the Calabasas Park Golf Course) are not generally visible to the public.

- Construction Impact

  Due to the undergrounding of the majority of the pipeline alignment, the impacts to scenic quality will generally be short-term (during construction).

  However, if the pipeline occurs on the surface of steep mountains or in the valleys, it can be visually distracting in the long-term. In all instances, alteration to topography will be restored to natural grade and will be allowed to revegetate. In areas of steep topography, additional erosion control measures may need to be taken and could present an adverse impact by altering the natural landscape. Revegetation with compatible native vegetation will minimize this impact.

4.2.6 Area Noise Levels

Due to the generally undeveloped nature of the area, noise levels are very low. There are no major sources of noise in the project area with the possible exception of the Ventura Freeway and Las Virgenes Road (the far western portion of the study area is exposed to these roads).

- Construction Impacts

  Impact to this low noise level would occur from pipeline construction and would be short-term. It is unlikely that, with the present undeveloped nature, that this would be upsetting to humans; however, many wildlife species will discontinue their use of the area due to the presence of man and machinery and the noise they produce. However, these impacts are short-term and will be eliminated when construction is complete.

4.2.7 Archaeological Impacts

The project area is hilly terrain between Las Virgenes Canyon and the western flanks of the San Fernando Valley. The majority of the project area is drained by McCoy Canyon; this watershed flows to the east into the San Fernando Valley. The area is a mosaic of the major plant associations found along the northern slopes of the Santa Monica Mountains. Of particular importance to aboriginal populations were the coastal sage (supporting hard seed producing grasses and shrubs, bulbs, and greens) and oak woodland (dominated by oaks which yielded acorns). A variety of small and large mammals are resident to this region.

Major aboriginal population centers existed in Las Virgenes Canyon and the western portion of the San Fernando Valley. The project vicinity has been utilized by aboriginal and European populations on a seasonal or temporary basis for primary collection and processing of foods and raw materials. Aboriginal remains may reflect the use of hard seed resources (the presence of manos and metates, and hammerstones), collection and processing of acorns (mortars and pestles), or hunting and butchering of large and small mammals (projectiles, knives, manufacturing wastes, hammerstones, and faunal remains). These remains may occur singly or concentrated, depending on the type and frequency of use. Historic remains would probably be limited to structures or trash associated with grazing.

Archival Investigation

The National Register of Historical Places and the California Inventory of Historic Resources were reviewed. A map prepared by the Archaeological Survey, UCLA, illustrating the location of archaeological sites within the Las Virgenes Municipal Water District was also consulted. No historic or prehistoric sites had been recorded within the project right-of-way or easement.

Prior to 1976 no systematic archaeological reconnaissance had been conducted in the project vicinity. UCLA crews had recorded sites in this general area over the last 15 years; more recently, California State University, Northridge, and Pierce College have inventoried sites in the western San Fernando Valley. In 1976 two environmental assessments were conducted in upper McCoy Canyon: Tentative Map 31164 (DeGarmo) and Calabasas Park (Singer). The DeGarmo study is to the north and east of this proposed project; the Singer study included the reservoir site and all but the western and eastern extremes of the water line. Both studies located archaeological sites; none will be directly affected by the proposed water line and reservoir development.

Field Investigation

The project site was visited on two occasions during March of 1977. The total extent of Alternative C and the reservoir were covered on foot in the company of a number of special consultants (Nelson Leonard, Archaeologist and author of this section), and representatives of Boyle Engineering, Las Virgenes Municipal Water District, EDAW, and Chris Chaloupka, (Archaeologist with the State Water Resources Control Board). The proposed alignment of the reclaimed water line is to follow an existing dirt road which is to be developed in the near future as a major paved access road to a proposed subdivision. A second visit was paid to investigate an archaeological site identified during the first field session. The site, which was thought to be directly affected by the proposed development required additional descriptive data which were necessary to assess possible adverse impacts and the eligibility of this site for listing on the National Register. Developers of the subdivision and contractors for the road construction were notified of the site and its potential eligibility on the National Register of Historic Places. Construction of the paved access road will precede the construction of the Calabasas Reclaimed Water Line.

As mentioned previously, the entire project area, right-of-way and easement of the water line and area of the reservoir, were investigated in a systematic manner on foot. Sufficient time was spent at the archaeological site location to describe the surface complexity of the deposit and provide a representation of the types of activities and possible dates of occupation.

Site 1

This site (approximately 2 1/2 miles south of the Ventura Freeway and 1 and 1/2 miles east of Las Virgenes Road) consists of two midden areas, one in a saddle and the second downslope to the south. The midden area in the saddle (northern component) is bisected by a dirt access road. Few surface remains exist; the majority of remains observed were located in the western bank of the road cut. The midden area measures approximately 50 meters (north/south) by 30 meters (east/west). The north/south extent is a relatively accurate estimate due to the road cut exposure. The east/west estimation is based on land form, the north/south extent, and the location of concentrations of material in the north/south profile. There is a soil color change associated with cultural remains, a change from light brown adobe to light gray-brown adobe soil. This change is most noticeable at the southern margin of the site. Material was concentrated in the relatively flat, low point in the saddle; the greatest depth of deposit (70 to 80 centimeters) was also observed at this point.

The cultural remains from the northern component are exemplified by the material quantified from the western bank of the road cut. Flakes and highly fragmented bone were the most frequent remains. The majority of the flakes were small, associated with production of small tools or the maintenance of such tools. Other items observed were a core, a bone awl, a knife, and two flake scrapers. A number of items of European manufacture and probably of very recent origin were also observed. The mid-section of a small projectile point and a hammerstone were observed on the surface (not associated with the systematic road cut investigation). Fire-affected rock was present, though no attempt was made to quantify it. No tools of ground stone were noted; no marine shellfish remains were observed.

The cultural assemblage suggests hunting activity. This component may be a fall camp at which populations collected and stored acorns; hunting activity would be associated with this type of use. The depth of deposit and alteration of soil color suggests a regular use of this area over some period of time. The small projectile point and the quantity of fused shale suggests that the occupation dates within the last 1,500 years.

This component has been impacted by construction and maintenance of the dirt access road; an area nine to ten meters wide has been disturbed; within this a right-of-way six meters wide has been scraped to sterile soil. The total area of this component has been cleared of brush; two older dirt roads occur upslope to the west of the site area. A fence, with a gate at the low point in the saddle, has been built across the site. Despite these modifications, much of the site remains intact.

The southern component is located approximately 50 meters south of the limits of the northern component. This component is located over gently sloping terrain adjacent to a heavily wooded arroyo. The western margin of the site is defined by a dirt access road, the southern and eastern margins by the arroyo. Surface remains are present in quantity; the real extent of remains may be more accurately described than that for the northern component.

Remains were found over an area measuring 50 meters (north/south) by 50 meters (east/west). Aboriginal remains (stone manufacturing waste, stone tools, food remains) were found over the total site area; material tended to concentrate in the southwestern half of the site. Historic architectural remains and trash dumps were located in the northeastern half of the site area. Depth of deposit may range to 50-70 centimeters.

The range and frequency of aboriginal remains was similar to the northern component; one additional category of remains was present - marine shellfish remains. Several pieces of mussel shell (*Mytilus* sps.?) were present on the surface. There was a noticieble soil color change associated with increased frequency of aboriginal remains - the soil took on a gray color in areas of high artifact density.

Historic remains consisted of an area which exhibited cedar or redwood planks, square nails, round-headed nail (only one observed), wire, siltstone boulders, small fragments of glass, and charcoal. This area appears to be the site of a structure. The majority of these remains are exposed in a shallow runoff channel (5-10 centimeters deep). Historic debris is scattered over the eastern half of the site; however, there is an additional concentration at the northeastern extreme of this component. Fragments of glass, porcelain and metal are concentrated on the steep slope leading down to the arroyo bottom. This area appears to be a dump site. Other historic artifacts may be found in the arroyo bottom at the base of the slope on the opposite bank. These objects may be associated with the motion picture industry or recent ranching.

Aboriginal occupation of the southern component appears to be similar to that of the northern component activities associated with hunting, butchering, and consumption of large and small mammals. The mid-section of a small projectile was also found on this component; this artifact and the amounts of fused shale chipping waste would place occupation within the last 1,500 years. The presence of marine shellfish remains may indicate that this component includes later occupation, use of the site at additional times of the year, or changing social and political alliances of the site's occupants. Historic remains suggest the presence of a relatively small structure and a trash dump. The date of occupation is probably the latter part of the 19th Century and early 20th Century. All but one of the nails observed (some 25 to 30) were square. Glass fragments suggest early 20th Century use. It is possible that the structure was built as a line cabin during the 1880's or 1890's and occupied until the 1920's. If the structure was standing, it may have been used by the movie industry.

Other Sites in the Project Vicinity

Singer and DeGarmo have located a number of sites in the project vicinity. DeGarmo (1976) located an extensive raw material source which was utilized by aboriginal populations. Quarry activity associated with an exposure of cobbles was represented by anvils, broken cobbles, and primary and secondary flakes. This site is situated on slopes to the north of McCoy Canyon Creek, at a point where the Canyon opens into rolling hills.

Singer (1976) located two limited sites near the proposed water line route in the central portion of the project area. One site, located less than 1,500 feet west of Site 1, LAn-866, consists of two manos and a metate; the other site, LAn-867, approximately 600 feet south of Site 1, consists of several chert flakes, a flake scraper, and two projectile points. These remains are probably contemporary with the aboriginal occupation of the site located during the present investigation. Singer also relocated and described LAn-219 which is situated on a high knoll at the margin of the valley drained by Las Virgenes (Malibu) Creek east of Las Virgenes Road. This site and the newly recorded activity area to the north represent a major campsite.

The bulk of the project area, the hilly and mountainous terrain, fell within the territory or territories of aboriginal populations based in the Las Virgenes drainage and/or people based in the southwestern portion of the San Fernando Valley. Isolated tools or locations exhibiting two or three tools probably represent daily use of the area by populations based outside the project area. The quarry site located by DeGarmo represents a temporary use of the project vicinity by populations traveling to this source for the express purpose of obtaining raw materials or by peoples combining search for food resources with acquisition of raw materials. Sites such as the one located during this investigation represent seasonal movement into the project area and occupation at least during the late summer and fall. Due to the dispersed nature of hard seeds and bulbs (use evidenced by manos and metates), these resources may have been collected on a daily basis by populations based several miles from the collecting zone. Acorns are a highly concentrated resource; a short-term intensive occupation (local habitation site) would best utilize this resource. Acorns could be collected in quantity and stored in granaries at collecting camps; these stores could be later tapped by peoples wintering in villages outside the project area. The historic remains located during this investigation are the only recorded historic features for the project area, excepting movie sets.

Evaluation of the Site's Importance

Components of Site 1 represent prehistoric aboriginal and historic European (?) use of the project area. These two middens represent the late summer and fall use of this region by aboriginal populations probably based in the southwestern San Fernando Valley. The depth of deposit, soil color alteration, and quantity and variety of cultural remains suggest a multi-use occupation spanning several hundreds of years. Occupation is probably limited to the last 1,500 years; however, this span of time represents a period of rapid growth and change. These middens represent an important source of information regarding aboriginal population growth, resource utilization, and social and economic exchange. The historic remains appear to represent a line cabin associated with grazing; no other historic buildings of this period have been noted for this general vicinity.

In summary, this site would appear to be eligible for listing on the National Register of Historic Places under the criterion that it has the potential to yield valuable information for the reconstruction of prehistoric and historic cultural development.

- Construction Impacts

  The archaeological site is located along the proposed route of Alternative C. Excavation for burial of the line would be limited, but would cause disturbance to deposit. Movement of the trenching machine and support vehicles and personnel may adversely affect the cultural remains. Currently, the proposed route falls in the existing dirt access road roadway. This roadway bisects the northern component and borders the southern; the line will be directly adjacent to the cultural deposit for a length of approximately 100 meters.

  The alignment of the proposed subdivision road also crosses this site, and the developers of this subdivision have been notified of the existence of this site. Studies are currently underway to either realign the road and/or to utilize techniques to protect the site (add fill and grade to the road above the site) or salvage the resources. Construction of the pipeline would be coordinated with the construction of this road to avoid unnecessary additional impact.

4.2.8 Energy Utilization

- **Operational Impacts**

  Electricity necessary to pump the reclaimed water to Calabasas Golf Course and adjacent orchard will utilize the equivalent amount of electrical energy used by approximately 252 residential units a year. This is approximately 1,663,960 kwh per year of electrical energy.

  Additional energy consumption will result from an increased amount of processed air chambers to be installed at the Tapia plant. If all air chambers were used at the same time (which is unlikely), the increase from the current consumption would be approximately 5-10% for the year 1997. This factor will remain constant for the reclaimed water line and the sludge alternative.

4.2.9 Health Considerations

- **Operation Impact**

  Public health impacts of the spray irrigation of the Calabasas Golf Course will be minimal since the effluent quality of the Tapia WRF meets and exceeds the quality guideline established by the State Department of Health ($<$ 2.2/100 ml. coliform count). Furthermore, the irrigation would occur at night and it will be required that any aerosols or runoff be contained within the spray irrigation area. If irrigation or orchards are to be realized, it may be by flood or drip irrigation as spray irrigation of food crops will require that the effluent be put through a process of coagulation, sedimentation, and filtration prior to disinfection. This is not currently planned for Tapia WRF. The State Department of Health does not restrict flood or drip irrigation by high quality secondary effluent for orchard crops.

4.3 DIRECT IMPACTS OF SOLIDS HANDLING ALTERNATIVE

4.3.1 Air Quality Impact

- **Construction Impacts**

  Construction operations will have a short-term impact to local air quality. These impacts would result from the necessary trenching, backfilling, and earthmoving required for laying of pipe and between the Tapia WRF and the Sampo-Hope property. Air quality impacts would stem from dust emissions and emissions of pollutants from construction equipment powered by internal combustion engines. Although these impacts are unavoidable, they would be of limited duration. Direct emissions can be largely minimized by mitigation measures related to construction practices, such as continual watering down of exposed soil. Air pollutant emissions from engine operations will be quite small in relation to overall regional vehicular emissions and should not be sufficient to have any significant adverse local effects. They would, however, add to the overall air pollution burden of the area. The construction related air quality impacts would be true of all other alternatives with the exception of trucking sludge to the Calabasas Landfill.

o Operation Impact

The operation of a tank truck to inject sludge into the soil will have a small impact to air quality due to the necessity of utilizing an internal combustion engine (diesel) to power the vehicle. The tank truck will operate during an 8 hour day on a 5 day week basis; however, the small quantity of emissions expected will not significantly affect local air quality. It is estimated that operation of the tank truck will utilize approximately 48 gallons of diesel fuel per day of operation.

Another concern related to air quality would be of odors associated with the biological degradation of sludge constituents. A properly operating activated sludge treatment plant can be practically odor-free. This has generally been the case with the existing Tapia WRF except in instances when the plant had been operating in excess of its design capacity and when wet sluge had been set aside to dry at the plant as a result of disposal sites being unavailable. These problems have been resolved by conversion of a tank to a digester and addition of a blower and discontinuance of the drying of sludge at the plant. The improvements to the sludge handling portion of the treatment plant should further resolve the odor problem. The injection disposal technique should further aid in controlling odors as the present practice of disposing sludge by spreading over land would cease. The injection of sludge at a depth of 6 to 8 inches should totally contain any odors. There is the possibility, however, that if the injected soil becomes saturated due to rainfall, wet sludge could rise to the surface and cause odors to emanate. The use of the Calabasas Landfill for sludge disposal during wet weather would alleviate the potential for this occurrence.

4.3.2 Hydrology

The Hope property is within the Las Virgenes Creek watershed area. Two intermittent streams flow westward into the valley areas from the hills to the east. Although these creeks are dry during most of the year, boulders present in their beds indicate that high velocity flows have occurred during past periods of intense precipitation.

The two alluvial valleys, which make up the northern part of the proposed disposal area, are underlain by alluvium which may contain minor amounts of groundwater. However, no extensive aquifers are known or expected in these valleys. No wells are known to exist on the property, and no seeps or springs were noted in the proposed disposal areas. The western half of the small valley north of Sampo Ranch was covered by very green vegetation, and was presumably under spray irrigation at the time of our site inspection of June 1977.

The Ross property is also within the Las Virgenes Creek watershed area. It is traversed from east to west by a small creek which is dry except during and following periods of high precipitation. Although parts of the proposed site are underlain by alluvial deposits, no extensive aquifer or groundwater storage areas are known or expected in this valley due to the shallow depth of alluvium and the fine grained nature of the soils. No wells are known to exist on the property, and no seeps or springs were noted in the proposed disposal area. Much of the flat ground was wet at the time of our inspection because the property was being spray irrigated.

The drainage area, upstream of the Sampo-Hope sludge farm site, is approximately 771 acres. This relatively small area (in comparison to 15,179 acres of the Las Virgenes Creek watershed), the low rainfall intensity (approximately 18 inches per year), and the natural undeveloped terrain of the area, should enable runoff collection to be easily accomplished and would not present any major environmental impacts.

- Operation Impacts

  The extent and nature of sludge farming's impact on groundwater conditions at the Sampo-Hope Ranch and the Ross Property is difficult to assess without more detailed information on existing conditions including permeability of surface and subsurface soils and depth and quality of groundwater. Under the alternative plans, sludge would not be placed on the sites during periods of high rainfall, which would reduce the possibility of runoff and leachate surface or groundwaters. On-site drainage of the sludge farm is to be retained without leaching by a collector drain system to carry any on-site runoff for return to the Tapia WRF. Additionally, a system of monitors is also to be utilized to control water movement through the ground and prevent contamination of groundwater resources. This would be accomplished by regulating the application of sludge so that vegetation uptake and evapo-transpiration would enable water to be "lost" rather than infiltrating to the groundwater. Heavy metal concentration in the plants grown would be periodically checked. The facility would be designed to divert runoff from the surrounding hills before entering the disposal area.

4.3.3 Pathogens and Heavy Metals

- Operation Impact

  There is some concern with sludge farming, and/or sludge disposal, of the potential health hazards that may result from contamination of surface and groundwater by heavy metals, chemicals, pathogenic organisms, viruses, protozoa (as cysts), and worms (as eggs).

Sewage sludges are highly variable in nature due to varying constituents in the influent. Improved treatment levels also tend to generally remove greater quantities of solids from the wastewater. Sewage sludges can contain concentrations of potentially toxic materials such as zinc, copper, nickel, boron, cadmium, pesticides, etc. which can be toxic to plants and may also be passed through the food chain to other life forms. Presently proposed Federal (EPA) and State (Health Department) standards are being studied by these agencies to determine appropriate criteria for wastewater sludge application to lands where food crops intended for human consumption is to be grown. These are shown in Table 49 and are compared with estimated sludge quality from Tapia WRF and also with values of various constituents contained naturally in soils and plants. As shown in the table, Tapia WRF sludge would be within acceptable levels.

The majority of heavy metals generally found in sludge result from inflow of industrial wastes into treatment plants. At the Tapia WRF, industrial wastewater flow is only 7% of the total average daily flow and as such this low quantity enables the low heavy metal concentration to be maintained.

Various independent studies, at this time, have indicated that heavy metals generally do not move rapidly in soil and are resistant to leaching. A recent study by Dr. Wade L. Berry, Laboratory of Nuclear Medicine and Radiation Biology, UCLA, utilized radioactive isotopes of a number of common heavy metal pollutants (cadmium, zinc, and copper) which were applied to the surface of soil columns and leached sequentially with water. A scanning camera was used for real time detection of movement and flow patterns of heavy metal isotopes in the soil. After the initial surface adsorption, all tracer elements were resistant to leaching by water.

Another study by USDA Biological Waste Management Laboratory, Beltsville, Maryland (Sept. 1975) assessed trench incorporation of sewage sludge in agricultural lands and over a 2 year period neither heavy metals nor pollution indicating organisms (coliform and salmonella) had moved more than 30 cm from entrenched emplacement into the surrounding soil. This finding was also corroborated with laboratory testing where it was found that quantities of water necessary to move viruses to a depth of of 5 feet, greatly exceeded that expected normal rainfall. The study found, however, that different soils vary in their capability of adsorbing viruses and the mechanism of virus sorption has yet to be defined for soil and is under study.

The study also found that metal tolerances among different species of crops vary. In general, grasses were the most tolerant and absorbed the least amount of metals. Vegetables were the least tolerant, and absorbed high quantities of metals. Zinc and cadmium were absorbed and readily translocated to plant tops. It has also been indicated by the State Department of Health that cadmium ends up in the leaf structure of plants rather than in seeds. In excess, these metals interfere with iron uptake through transport which causes stunting of plant roots and tops without killing the plants.

If crops are grown they would most likely be used for livestock feed and as such, cadmium could be ingested by livestock. Cadmium would collect in the kidneys of these animals. The State Department of Health indicates that due to the short life span of meat producing livestock, accumulation of heavy metals would be low and since kidneys are also not considered a principle cut of meat, the hazards to humans would be low.

4.3.4 Geology/Soils

The Sampo-Hope property is underlain by sandstone, siltsone, and shale of the Miocene Topanga Formation. In the valley areas, these rocks are covered with alluvium of Quaternary age (Elam, 1947; Brown, 1957) which may be up to 20 feet thick in the Sampo Ranch area. The sedimentary rocks are well exposed in the upland portions of the site, where resistant sandstone beds crop out as linear, northerly striking ribs along the hillsides. Shale and siltsone are also exposed on the steep portions of the property, but are not as resistant as the sandstone. Sandstone outcrops near the valley margins are hard, pale brown, and micaceous. The sandstone is generally massive, but graded bedding is often present. The weathered shale, as exposed in a roadcut in the northern portion of the Hope property, appears to be readily excavable with conventional backhoe to a depth of at least several feet. The two proposed pipeline routes are underlain mainly by alluvium and weathered shale; no hard rock outcrops were observed along the pipeline routes during our site reconnaissance of June 1977.

The Ross Property is underlain by Miocene volcanic and sedimentary rocks, which are covered with alluvial deposits of Quaternary age in the relatively flat valley portions. The volcanic rocks, which are present in the southern three-fourths of the property, consist primarily of basalt flows and breccias of the Topanga Formation. They are well exposed on the linear west-trending ridge near the valley head and on a low hill just north of this ridge. Reddish brown to black weathered rock exists around the margins of these hills, and gopher holes show that rock is covered by a clayey soil at least 2 to 4 feet thick on the valley floor.

The northernmost portion of the property is underlain by pale yellowish brown arkosic sandstone and brown to gray siltstone of the Topanga Formation. These rocks are generally not well exposed within the proposed disposal area, although they crop out on the Hope property to the north. Sandstone and siltstone weather to sandy silty soils which are estimated to be 2-6 feet thick on the valley floor.

In general, neither the sedimentary nor volcanic rocks at the site are pervasively fractured or sheared on the surface. Permeability of the bedrock materials is therefore not expected to be very high near the surface of the ground.

Slope Stability

Large landslides have been mapped directly northeast of the Hope property, and slope failures in the hills south of Sampo Ranch are partially within the property boundaries, but no landslides have been mapped near the proposed disposal sites (Elam, 1948; Brown, 1957). No recent landslides were noted during our June 1977 site reconnaissance, and the proposed slurry pipeline and storage tanks would not be affected by the existing landslides east and north of the site. There is some evidence that mud flows or debris flows have occurred on the Hope property in the past, in the east end of the valley north of Sampo Ranch. It might be advisable to locate storage tanks away from the valley head.

A small landslide has been mapped on the steep hill in the northwest corner of the property, and a second slide has been mapped just north of the property line (Yerkes and others, 1971). No major slope failures were noted at the time of reconnaissance in June 1977. The proposed slurry pipeline and storage tanks, as presently sited, would not be affected by the known landslides. During periods of very intense precipitation, mud flows could also occur, particularly in the eastern part of the property.

Other Geologic Hazards

No active faults cross the alignment on either property so that no ground rupture is expected from fault movement. Although loose sandy soils were observed at the ground surface in the east portion of Sampo Ranch, they were clearly above the water table and would not, therefore, be subject to liquefaction during strong ground shaking. Even if liquefaction were to occur, it would not affect the proposed facilities, as no structures or pipelines are planned for this area.

Since the alignment is not near the ocean and there are no lakes along it, there is no tsunami or seiche hazard.

No land subsidence due to extraction of groundwater, gas, oil, or to hydrocompaction are known to occur in the area, and none is expected.

There are no volcanic hazards in the area. The nearest known volcanic center with Quaternary activity is more than 100 miles away and poses no threat to the project.

No liquefiable soils have been identified on the Ross property.

Since the Ross property is not near the ocean and there are no lakes along it, there is no tsunami or seiche hazard.

Soils

Upland soils on the Hope property are thin and gravelly, while valley soils are thick and relatively fine grained. Where derived from siltstone or shale, the soils have a clayey silt or silty clay texture; but where the parent material is sandstone, the soils are typically less clayey, having a sandy silt or silty sand texture. Rock fragments are common near the base of the soil profile where it grades into the underlying bedrock.

Soil series mapped on the property by the Soil Conservation Service include Arnold, Calleguas, and Millsholm in the upland portions and Sorrento and Yolo in the valley areas. The mapped soil phases and their distributions are described below (Soil Conservation Service, 1967).

CAF2: Calleguas and Arnold loamy sand, 30 to 50 percent slopes, eroded, 0-16 inches thick, moderately expansive. Estimated permeability 6-10 inches per hour. This soil is developed on sedimentary rocks in the hills at the southernmost end of the property.

MhF: Millsholm loam, 15 to 50 percent slopes, 0-20 inches thick, moderately expansive. Estimated permeability 0.2-2.5 inches per hour. This soil is developed on sedimentary rocks in the hills of the northern and central portions of the property.

SoC; Sorrento loam, 2 to 9 percent slopes, 60 inches thick, moderately expansive. Estimated permeability 0.8-2.5 inches per hour. This soil is developed from alluvium and occupies a small part of the valley areas along Las Virgenes Road.

YoC: Yolo silt loam, 2 to 9 percent slopes, over 60 inches thick, low to moderate expansivity. Estimated permeability 0.8 -2.5 inches per hour. This soil is derived from alluvium. Most of the proposed disposal area is occupied by Yolo soils.

Upland soils on the Ross property are thin and gravelly while valley soils are thick and relatively fine grained. Where derived from basalt or siltstone, the soils have a clayey silt or silty clay texture, but where the parent material is sandstone, the soils are typically less clayey, having a sandy silt or silty sand texture. Rock fragments are common near the base of the soil profile where it grades into the underlying bedrock.

Soils on the Ross property belong to the Calleguas, Arnold, Hambright, Vina and Sorrento series. The Calleguas, Arnold and Hambright series are found only in the steeper portions of the property, while the Vina and Sorrento series are the valley soils. The mapped soil phases and their distributions are described below (Soil Conservation Service, 1967).

CAF2: Calleguas and Arnold loamy sand, 30 to 50 percent slopes, eroded, 0-16 inches thick, moderately expansive. Estimated permeability 5-10 inches per hour. This soil is developed on sedimentary rocks in the hills in the north part of the Ross property.

HrF: Hambright rocky clay loam, 15 to 50 percent slopes, 0-18 inches thick, moderately expansive. Estimated permeability 0.8-2.5 inches per hour in the upper 3 inches; 0.2-0.8 below. This soil is developed on the basalt and breccia of the steep hills in the southeast portion of the property.

HcF: Hambright clay loam, 30 to 50 percent slopes, 0-18 inches thick, moderately expansive. Estimated permeability 0.8-2.5 inches per hour in the upper 3 inches; 0.2-0.8 below. This soil is developed on the basalt and breccia of the low hills in the central portion of the property.

VnC: Vina Loam, 2 to 9 percent slopes, 60 inches thick, moderately expansive. Estimated permeability 0.8-2.5 inches per hour. This soil is developed from alluvium and occupies most of the valley areas of the property.

SoC: Sorrento loam, 2 to 9 percent slopes, 60 inches thick, moderately expansive. Estimated permeability 0.8-2.5 inches per hour in the upper 4 feet; 2.5-5.0 inches per hour below. This soil is developed on the alluvium in the northern part of the valley area.

- Construction Impacts

Construction associated with both the Sampo-Hope Ranch and the Ross Property would be limited to burial of 4"-6" diameter pipeline and erection of storage tanks. These activities would have only minor (and for the most part temporary) effects on the soils and geologic conditions of the sites, and none on the seismologic conditions. Because access roads exist on both sites, and because construction activities would be confined to the nearly level portions of the sites, the impact of soils, geologic, and seismologic conditions on construction of a pipeline on either site and tanks associated with the operation would also be relatively minor.

Most normal construction activities associated especially with development of a pipeline and storage tanks, especially grading and trenching, would disturb soils (and possibly rock outcrops) along the alignment. As shallow trenches and only minor grading are proposed, the effects of this disturbance would be minor. Along the pipeline route, soil structure and physical properties would be altered by mixing during construction, resulting in increased erosion susceptibility and sediment yield (especially if construction takes place during the winter rainy season), changes in surface runoff, permeability and infiltration rates. These effects can be minimized by shallow burial, proper compaction of trench backfill materials and by revegetation as necessary.

The moderately expansive soils of the sites would not be expected to have a major impact on the proposed pipelines, and appropriate design provisions would eliminate the shrink-swell hazard that could cause undesirable stresses from horizontal and vertical displacement of the pipe. The adverse effect of expansive soils on the storage tanks could be minimized or eliminated by the use of special foundation treatment, if necessary.

No construction difficulties are anticipated, unless the pipeline is routed across areas of hard bedrock. It should, however, be possible to avoid drilling and blasting by placing the pipe at shallow depth along the shoulder of existing roads at the sites. No dewatering of trenches is anticipated, since there are no known shallow groundwater bodies in the area. If construction takes place during the winter rainy season, groundwater could be encountered at shallow depth near the existing drainage. Anticipated quantities could be handled by portable pumps.

Slope instability would not affect construction of the pipeline and storage tanks as these would be placed entirely on the valley floor, away from the toes of known landslides.

The probability of strong ground shaking due to a nearby earthquake is very low during the construction period. Even should this occur, the effects would probably not be severe, as no deep excavation or steep cuts are planned. No liquefaction would be expected, as saturated susceptible soils are not present on the sites.

- Operation and Maintenance

Operation and maintenance of a sludge disposal facility would have a major impact on existing soils at both sites and possibly also on groundwater conditions, but would have no impact on the geologic or seismic environment of either site. Injection of sludge into the soils would markedly alter the chemical makeup, texture, structure, porosity, permeability and fertility of the native soil. This could be a beneficial impact, especially if the disposal area were to be reclaimed for agricultural use immediately or at some future date.

No impacts are anticipated on soils of the area from normal operation and maintenance of the pipeline system. Should there be rupture of the pipeline, flow of the slurry wastes could cause erosion of the soils near the point of rupture. Repairs could be made fast enough to prevent major damages.

No impacts are expected from existing soils and geologic conditions on operations and maintenance of either facility. A large earthquake in the vicinity could cause strong ground shaking at the disposal site. Strong groundshaking could produce leaks on weak pipe joints, allowing seepage from the pipeline to occur undetected. Ground shaking might also cause damage to the storage tanks. This possibility could be reduced by designing the tanks and pipe joints to withstand seismic shaking.

4.3.5 Biota

Both the Sampo-Hope Ranch and the Ross properties have been disturbed by grazing or agriculture, particularly in those areas proposed for sludge application. As a result, the majority of biotic resources here are in poor condition. Both sites contain areas of cismontane introduced grassland, Oak Woodland, and Southern Riparian Woodland. See Chapter 2 for a description of these biotic communities, and the wildlife habitats associated with each.

- Construction Impacts

  From a biological standpoint, the alternative possessing the least biological significance is the Sampo-Hope property. Although existing oak woodland located in an interior canyon on the Sampo ranch may unavoidably be impacted, they are not as extensive and as well developed as those on the Ross site. Unusually large and healthy oaks, similar to those on the Ross property are not present on disposal areas within the Sampo-Hope property. In addition, as a result of the disturbed conditions, their value as wildlife habitat is low.

  Construction of pipelines to transport the unthickened sludge via pumping station and force main may result in the destruction of some oak woodland habitat surrounding the proposed farm areas. Oaks on the Ross site occur in areas that could be spray irrigated. The loss of this habitat would displace native populations of terrestrial vertebrates. Native oaks do not tolerage changes once mature. Substantial changes in their environment would weaken and/or kill healthy oaks. Construction activities within oak woodland habitat may destroy oak trees in this manner, especially if the soil between the dripline (the area within the maximum circumference of the foliage) and the trunk of a tree is disturbed. Oak trees may be destroyed through trenching activities which sever significant portions of root systems or through extensive pruning for clearance. Earth moving or other heavy equipment may compact soil beneath trees. This will inhibit essential gas exchange between roots and the atmosphere, and it will restrict water movement into the root zone. This will result in the eventual loss of trees. Stockpiling beneath trees may also result in soil compaction or it may have an opposite effect by trapping excessive moisture which may cause root crown rot.

A fire hazard potential does exist if construction takes place during the summer following a dry winter. Vegetation will be highly volatile and the potential for an accidental fire is high. This factor can be mitigated by special precautions.

- Operation Impacts

Oaks are very susceptible to excessive watering, particularly in the summer. The increased water region resulting from sludge application is expected to kill oaks growing within the application areas. Although the total number of oaks to be effected in this manner is small, several very large specimens could be lost.

Additionally, the constant disturbance to a disposal site will result in the establishment of obnoxious weed species. Under increased water and nutrients, these species will proliferate and invade adjacent natural communities. However, farming operations will control weed growth.

4.3.6 General Scenic Quality

Both Sampo-Hope Ranch, and the Ross property are adjacent to first priority scenic highways (Las Virgenes/Malibu Canyon Road and Mulholland Highway) of excellent scenic and visual qualities. The Las Virgenes/Malibu Canyon Road traverses an area that presents visual resources of steep ridges, valleys dotted with livestock or crops, rock outcropping, Las Virgenes and Malibu Creeks, riparian woodlands, and finally, the ocean. In the vicinity of the Sampo-Hope Ranch, the valley presents peaceful grazing and farming lands backed by the rugged Santa Monica Mountains.

The Ross Property is highly visible from the scenic Mulholland Highway. This highway offers the viewer a unique resource in spectacular views from the City of Los Angeles to the ocean at Leo Carillo State Beach. The road curves picturesquely around the Ross property where views are offered of the rural valley of the Las Virgenes Creek drainage basin. The Ross property and Claretian Seminary, viewed from the curve in the road, are dramatic with a blending of green valleys, large oak and eucalyptus trees, small rolling ridges and striking chaparral covered mountains.

- Construction Impacts

  Construction of the pipeline at either site, will have a short-term impact on the scenic quality of Las Virgenes Road due to the physical and visual disruption occurring adjacent to the road. However, since construction will occur mostly during the week, people driving for pleasure during the weekend will not be significantly impacted.

  With either alternative site, channels to divert off-site waters around the sludge application area to Las Virgenes Creek will be constructed. Although the channels are not yet in the specific design stage, it is anticipated that when detail design does occur, visual considerations will be taken into account.

  Therefore, at this time, it is not possible to describe either general or specific visual impacts of the diversion channels or mitigation measures thereof.

- Operational Impacts

  The only physical and visual manifestation of a sludge farm operation at the Sampo-Hope Ranch would be the storage tanks. With a 2% solids content sludge, 3 tanks containing 150,000 gallons each of slurry would be constructed on the ranch. Each tank would be 42 feet in circumference and 16 feet in height.

  A 4% solids content sludge would only require two 80,000 gallon tanks, 30 feet in circumference and 16 feet in height. Either system would require a dissolved air floatation unit, thirty feet by sixteen feet. The bulk and number of these tanks will be partially visible from Las Virgenes Road. They will be completely visible from a potential trail connected with Malibu Creek State Park on the ridge west of the ranch. Carefully placed vegetative screening could lessen the visual impact of the tanks. The injection operation will not be visually distracting since it is identifiable with current farming activities on the ranch.

The Ross property would have the same type of system of tanks as the preferred site of Sampo Ranch. However, the visual impact of the tanks would be much greater since the property is highly visible from both the east and west bound lanes of Mulholland Highway. The highway is slightly elevated above the valley which gives the viewer a sweeping view of Ross property and the entire valley. A ridge that visually separates a portion of the Ross property from the Claretian Seminary will partially cut off views of the tanks from the potential park and camping activities that could take place there. Trees in the area can also cut off some views of the tanks. Residents living and traveling along Stokes Canyon Road will be able to see the tanks as they approach Mulholland Highway. It may be possible to lessen the visual impact of the tanks with property screening and plantings. The actual sludge injection into the soil would not be visually disruptive as it continues the appearance of a rural, farm-like operation.

4.3.7 Land Use Impacts

The existing land uses adjacent to, or adjoining the Sampo-Hope Ranch are open spaces and farm land. Cattle graze on the ranch east of Las Virgenes Road, and alfalfa is grown on the flat parcels of land west of the road.

Recently, the State Department of Parks and Recreation purchased the Hope property west of Las Virgenes Road, and intends to develop it in the future as a campground for the Malibu Creek State Park. The park will have equestrian and hiking trails, assessibility to back country and open spaces, and some creek play related to the campground. Presently, the General Development Plan for Malibu Creek State Park shows approximately 100 camp sites with provisions for water, sanitary stations and camp tables. A multi-use campground for group camping use is also planned. All camping areas are to be located to the east and west of Las Virgenes Creek and to the west of Las Virgenes Road.

Land uses in and around the Ross property are the same rural type activities that occur at Sampo-Hope Ranch. The Claretville Farm, located west of the Ross property, is used for pasture land and the production of alfalfa. This property is currently approved for acquisition in the State of California's 1977-78 budget, and could become part of the adjoining Malibu Creek State Park. Park planners indicate that the Claretville Farm could be used as a "staging area", in which children from the inner city can experience the rural atmosphere of the area, and have easy access to Malibu Creek State Park. Existing buildings could be converted to dorms, and an environmental center established. Camping areas are a further possibility for land uses within the farm property.

o Operational Impacts

The introduction of a sludge farm, that as a by-product produces sod-forage crops at the Sampo-Hope Ranch, is not a significant land use change, since the farming aspect of the project retains the present atmosphere of rural activity. It also does not present a negative compatibility factor with the Malibu Creek State Park, for that same reason. Campers, if they see the sludge injection truck/tractors at all, may only perceive farm work taking place. The only aspect of the farm that could be detrimental to campers and hikers, would be the view of the three tanks from a potential ridge trail leading out of the campground to Liberty Canyon. However, well placed vegetation could mitigate this factor. The operational impacts of sludge farming at the Ross property would have no significant land use impacts, since, as with the Sampo-Hope Ranch, the use is basically remaining the same. One potential impact could occur as a result of park visitors attempting to investigate the "farming" operations at the Ross property if and when park development occurs at the Claretville Farm. Currently, a barbed wire fence and trees separate the Ross property from Claretville Farms. If the sludge farming were to take place on property so physically and visually close to camping and overnight areas, park visitors could be tempted to investigate what could be an attractive nuisance. To deter park visitors from playing or attempting to play on the sludge farming property, additional vegetation could be used to visually and physically cut off accessibility.

4.3.8 Archaeology

The site areas are addressed in the archaeological records search produced for the Las Virgenes Municipal Water District (Rosen 1976) and by a recent environmental assessment within the district (Leonard 1977). Primary sources for these summaries are King (1967), King, Blackburn and Chandonet (1968), and Leonard (1971). The Malibu Creek drainage system contains archaeological resources that reflect cultural development from earliest occupation of the Santa Monica Mountains until the present.

Archival Investigation

In 1976 the UCLA Archaeological survey produced an archaeological records search for the service area of the Water District. Inasmuch as the Resource Agency of the State Department of Parks and Recreation conducted a large scale archaeological reconnaissance subsequent to this inventory a second literature search was requested for the specific areas under consideration for this project. An historical overview was conducted by Michael McIntyre of the Northridge Archaeological Research Center (see the Appendix).

Field Investigation

The project site was visited on two occasions during the months of June and July, 1977. Each landspread site was visited as was the right-of-way of Las Virgenes Road. Due to heavy groundcover over much of the Ross property and the Sampo Ranch, not all the areas to be directly affected were investigated in a systematic manner. A heavy growth of mustard covered 90 to 95% of the Ross property; high ground and the periphery of the parcel were covered on foot. Portions of the Sampo Ranch were under cultivation or fallow with wild grasses; approximately 70% of this area was observed in a systematic manner. Although the area was not totally observed (due to weed coverage), the areas observed plus information derived from archival sources provides a data base sufficient to make evaluative statements regarding the relative sensitivity of each parcel.

Data

The recent literature search of the UCLA records indicates the presence of 14 archaeological sites within 500 feet of the project sites and pipelines. The majority of these sites are located on the banks of Las Virgenes Creek and represent villages or multi-purpose temporary camps. Four of these sites have been excavated; the information from LAn-225, 227, and 229 (the Century Ranch sites) have been published (King, Blackburn and Chandonet 1968); the fourth site, LAn-840, was excavated earlier this year by a UCLA field class.

Field reconnaissance, associated with this study, did not locate additional sites; however, the boundaries of one site, LAn-730, were enlarged. Two archaeological sites fall within the project area, and subsurface features of a third may also occur within the project.

LAn-229 is a major late prehistoric-historic village. The aboriginal name for this site is thought to be Talopop (King, Blackburn and Chandonet 1968). Portions of this site were excavated in 1961. The deposit is located south of the intersection of Mulholland and Las Virgenes Canyon Road. The site measures approximately 750 x 225 feet; approximately 500 feet of deposit is divided by Las Virgenes Canyon Road. The average depth of deposit is three feet. During road construction approximately six to twelve inches of deposit were removed. The remainder of the site has suffered no other significant disturbances. The UCLA literature search regards this site as being eligible for listing on the National Register. The author would concur with this statement. Few late period villages remain within the Santa Monica Mountains. Information from this village would be critical to analyze regarding the relationships of coastal based populations to those of the interior Santa Monica Mountains and the San Fernando Valley. Malibu Canyon and Las Virgenes Canyon were the historic dividing line between the Chumash and the Gabrielino. The village of Talopop was probably an important link in the relations between the coastal village of Malibu (Chumash) and Gabrielino villages in the San Fernando Valley.

LAn-730 was recorded during the 1976 reconnaissance of Malibu Creek State Park. At that time the eastern extent of this site was defined by Las Virgenes Canyon Road. The site was recorded as a large occupation site on the eastern bank of Las Virgenes Canyon Creek.

Field work associated with this project located material on the eastern side of Las Virgenes Canyon Road on the Sampo Ranch Property. Stone tools and manufacturing waste were observed along the road cut. No artifacts or manufacturing waste were observed in the plowed field; however, the soil was noticeably darker in that portion of the field adjacent to the cultural remains in the road cut. The Sampo Ranch property apparently contains the eastern margin of LAn-730, an area measuring approximately 100 by 400 feet. The depth of deposit probably does not exceed 18 inches. Few cultural remains were observed; however, the few that were observed and the size and location of the deposit indicate that this is a village or major temporary camp site. The presence of the material fused shale in the stone manufacturing waste, and a fragment of a "flower-pot" mortar suggest the site dates after 200 to 500 A.D.

No other cultural resources were observed in the areas to be directly affected. One additional site, a recent house probably associated with dry farming, was observed on the Sampo Ranch. Cultural debris indicated that this house could have been occupied between the 1930's and the last few years. Cement foundations and household debris remain directly adjacent to an area of proposed use.

The two alternative sites for landspreading may be ranked according to cultural resource sensitivity. No cultural resources were observed on the Ross property. Although nearly all of this land was overgrown it may be expected that no archaeological sites exist on this land, or if material is present, it will be in the form of a limited use site and have been significantly affected by agriculture. One archaeological site was recorded on the Sampo Ranch property. This site will be directly affected by proposed land use. All portions of this land were not observed; it is possible that additional resources may exist. However, as in the case of the Ross property, additional remains would probably be of limited extent and have been impacted by agriculture.

- Construction Impacts

  Construction of the pipeline to transport sludge would effect one archaeological site located west of Las Virgenes Road and north of Old Las Virgenes Road. According to field observations by the excavators of LAn-229, approximately 500 feet of this site would be affected by pipeline excavation. Their surface estimates were qualified by a statement that the area of "concentrated midden is about 300 by 125 feet" (King, Blackburn, and Chandonet 1968). The figure of 300 feet is more in agreement with estimates by the author of midden extent that would be adversely effected.

Midden with sufficient depth not to have been totally destroyed by road construction was estimated; 350 feet of pipeline trench will affect undisturbed deposit. Current plans describe the excavation for the pipe to be a narrow trench for a 4 to 6 inch pipe excavated to a depth of about 24 inches. Any alteration of undisturbed deposit will have an adverse effect upon this cultural resource. However, the size of the trench excavation would probably not cause significant adverse effects, or effects that would argue for a no project decision.

- Operational Impacts

  Disposal of sludge would alter the soil chemistry and increase soil moisture. These changes would have a significant effect upon faunal (food) remains and human skeletal remains. Inasmuch as both sites have been previously cultivated, the utilization of land after sludge application would not be an important factor in site choice.

4.3.9 Transportation Impacts

The Tapia WRF is located off Malibu Canyon Road adjacent to Tapia Park. The Sampo-Hope property, site of the preferred alternative, is located on the eastern side of Las Virgenes Road, approximately 3.3 miles from the Tapia plant.

Calabasas Landfill, the current sludge disposal site during wet weather, is approximately 6 miles from the Tapia facility on Lost Hills Road. One truck from the Tapia plant makes an average of eight trips per day to either the Calabasas Landfill or the Sampo Ranch. The sludge is hauled to the disposal site in a 10 wheel Heil truck which accommodates a 7 cubic yard bin.

The location of the Ross property alternative for the sludge disposal operation is approximately 2.7 miles from the Tapia plant and east of the intersection of Mulholland Highway and Las Virgenes Road.

- Construction Impacts

  Specific construction impacts relating to pipeline installation for the Sampo-Hope property cannot be fully analyzed as the proposed project is only in the planning stage; not in the specific design stage. Specific plans for the pipeline alignment can only be developed under Step II funding. With the preliminary data, generalized impacts, as they relate to the transportation systems in the area, can be discussed. Installation of approximately 18,000 feet of pipeline along Las Virgenes Road (connecting the Tapia plant to the sludge holding tanks on the Sampo-Hope property) should take approximately 45 days. The installation process which would cause possible traffic disruptions would be a result of trenching operations.

If space is available in the easements for the pipeline along the entire 3.3 miles of Las Virgenes Road, disruption to traffic along the route would be minimal. However, if the unavailability of space in the easements makes it necessary to place the line under portions of the road, motorists would experience sections of one lane traffic along Las Virgenes Road resulting in a greater impact to the transportation system.

Impacts to the transportation system would be the same for the Ross property alternative, except that the placement of the pipeline would occur along Mulholland Highway, as well as Las Virgenes Road.

- Operation Impacts

  Should the sludge be trucked to the Sampo-Hope property or the Ross property rather than transported via a pipeline, or should the Calabasas Landfill alternative be selected, it is anticipated that additional storage facilities would be added at the Tapia WRF to accommodate the increased volume of sludge and that the sludge would be transported in a new 15 cubic yard truck. As the LVMWD currently utilizes a 7 cubic yard truck (at 8 trips per day) to transport the sludge generated by the 4 mgd plant, the 8 mgd plant capacity would only require approximately 2.8 trips per day with the 15 cubic yard truck. This represents a decrease in the total number of trips per day required to transport the sludge to the disposal site. Therefore, there will be no impact on the transporation system as a result of increased sludge handling capacity.

The pumping of sludge to the Sampo-Hope property would not impact traffic circulation along Las Virgenes Canyon Road, but trucking either to Sampo-Hope or Calabasas Landfill (though less of an impact than present conditions) would be greater than pumping.

4.3.10 Noise Impacts

- Construction Impacts

  Noise related to construction of the pipeline would be the result of the trenching machine. However, since the trenching operation would not occur near residential areas and the machine itself is equipped with standard noise supression devices, the impact to passing motorists would be extremely minimal and short-term.

- Operation Impact

  The noise resulting from the sludge injection process at either the Sampo-Hope property or the Ross property would emanate from the sludge injection vehicle. The vehicle currently being considered (or a comparable) would be a lightweight truck cab chassis on which a 1,600 gallon tank would be mounted. Although the truck would be equipped with four large floatation tires, because of the modifications made to accommodate the tank and sludge injection equipment, the vehicle would be 11 feet wide. As on-road vehicles cannot exceed 8 feet in width, this sludge injection vehicle would only be used on the disposal fields themselves and would be classified as an agricultural vehicle.

  The manufacturer of this type of vehicle has indicated that noise levels outside the cab would not exceed 86 dBA. This noise level is approximately equivalent to standing 22 feet from a freeway.

  As there are no residential developments near the sludge disposal sites, the impact would not effect sound sensitive receptors.

  There would be no additional impacts to the noise levels on Las Virgenes Road if the sludge is trucked to the Sampo-Hope property as that is the method currently utilized for private reuse of sludge. If the sludge is trucked to the Calabasas Landfill on a year-round basis, the addition to the overall noise levels on Los Hills Road (the primary entrance route to the landfill site) would be negligible.

4.3.11 Energy Utilization

- Operation Impacts

The amount of KWH consumed annually varies among the three alternatives, from a low of 142,444 KWH (in 1977) for the Calabasas Landfill alternative to a high of 1,091,000 (1997) for sludge farming at the Sampo-Hope site (See Table 50). The difference in electrical consumption can be attributed to the two different systems used for sludge disposal. Trucking sludge to the landfill requires that five DCG's, (dual cell gravity thickners) and a roller press be added to the Tapia plant. These would be the only new units requiring electrical power.

With either the Sampo or Ross alternative, four new elements requiring electricity would be necessary for the sludge farming operation. These elements include two aeration units (one at the plant, and one at the site), the pumping mechanisms, and a dissolved air floatation thickner. The electrical power necessary to operate the sludge disposal operation at the Sampo-Hope site in 1997 is equivalent to the annual energy consumption of approximately 165 residential units. The electrical consumption used by the Calabasas alternative is equivalent to 21 residential units. However, as shown on Table 47 (Chapter 3.0), the Calabasas Landfill alternative is the most expensive of all three alternatives to operate on a annual basis. It is almost twice as expensive as the Sampo and Ross alternatives. This is primarily due to maintenance of the DCG's, chemical costs and annual dumping fees (which are subject to price increases). The primary cost for the other two alternatives is a result of power and operational costs. Capital costs are the highest for the

Sampo-Hope Alternative, however, these costs will be off-set during the 20 year planning period whereas the lower capital costs of the Calabasas Landfill alternative are offset by the higher continued operating costs.

The Calabasas alternative will utilize approximately 2,340 gallons of diesel fuel per year in 1997. This assumes that the trucks consume approximately six miles per gallon of fuel. Injection trucks for the other two alternatives will utilize four times as much diesel fuel per year as the Calabasas alternative. These are based on a six gallon per hour consumption rate.

TABLE 48

Tapia WRF
Digested Sludge Estimated Quality -

Units of Expression		Tapia[1]
Total Solids	%	Approx. 2.53%
Volatile Solids	%	Approx. 74%
Metals	ppm dry weight	
Cadmium		8.3
Copper		648
Nickel		35.4
Lead		122
Zinc		870
Silver		102
Chromium		70.2
Cobalt		10.7
Manganese		261
Iron		12471
Magnesium		5221
Silicon		75408
Calcium		15082
Aluminum		22912
Phosphorus		7541
Titanium		3480
Barium		493
Boron		44
Tin		183
Gallium		15
Bismyth		6
Molybdenum		46
Vanadium		28
Sodium		7541
Zirconium		186
Potassium		6381

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1. LVMWD

TABLE 49

COMPARISON OF CONSTITUENTS IN TAPIA SLUDGE WITH OBSERVED RANGES AND PUBLISHED CRITERIA

	Observed Concentration Range			Criteria			
Element	In Soils [1]	In Plants	In Tapia WRF Sludge [2]	EPA[3]	USDA[4]	Calif. Dept. of Health [5]	Effects of Excessive Concentrations
Cadmium	.1-7 [6]	.2-.8 [6]	8.3	10	.5% of zinc	25 ppm-100 1.5% of zinc	Must be kept below phytotoxic levels; can accumulate in liver, kidneys, pancreas, and thyroid of animals, including humans.
Chromium	?	?	70.2				Not phytotoxic nor a threat to humans or terrestrial food chains since it occurs as CR^{+}3; However, it can be toxic to aquatic life in runnoff in the CR^{+}6 form.
Copper	2-100 [6]	4-15 [6]	648	1000	800		Phytotoxic at levels below those dangerous to food chain except in case of grazing animals; reduces root yield; essential in metabolism of iron.

Nickel	10-1000^6	1^6	35.4	200	100		Phytotoxic, particularly to citrus; reduces root yield; very low toxicity to man.
Lead	2-200^6	.1-10^6	122	700	1000		Highly toxic to plants; accumulates in bone; not readily translocated to food portion of plants; danger from sludge sprayed on foliage.
Zinc	10-300^6	15-200 ^{6}	870	2000	20000		Necessary in trace quantities; reduces root yield; nontoxic to humans in normal concentrations.
Polychlorinated Biphenyls	.01-3.3					10	Toxic to all forms of aquatic life; undergoes bioaccumulation and represents a threat to both aquatic and terrestial food chains.

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1. Brady, N. C., 1974, The Nature and Properties of Soils
2. LVMWD See Table ____.
3. Interim guidelines for maximum content in sludges to be applied to land which will ever grow crops in the human food chain (May, 1974).
4. Chaney, 1973, Recycling Municipal Sludges and Effluents on Land, proceedings of Illinois conference sponsored by EPA in 1973.
5. Proposed State minimum standards (Draft, September, 1976).
6. Naturally occurring values
7. Nisbet, I. C. T., 1976, Criteria Document for PCB's, prepared for EPA by Massachusettes Audubon Society.

TABLE 50

Total Annual Energy Consumption

	1977		1987		1997	
	KWH/Yr.	Diesel Fuel Gal/Yr.	KWH/Hr.	Diesel Fuel Gal/Yr.	KWH/Yr.	Diesel Fuel Gal/Yr.
Calabasas	87,050	1,440	126,616	2,016	142,444	2,340
Ross	979,400	5,430	1,027,000	7,690	1,074,000	8,930
Sampo-Hope	988,500	5,430	1,040,000	7,690	1,091,000	8,930

5.0 Secondary Impacts of Alternatives

5.0 SECONDARY IMPACTS OF ALTERNATIVES - DYNAMICS OF GROWTH

Of all secondary impacts that can be associated with the development of sewage treatment facilities, the single issue which is the root issue of all secondary impacts, is the potential growth inducement caused by a proposed plan. An increase in population and the locations and intensities of this increase can create changes in traffic circulation, air quality, noise levels, demands on public services, and an overall change in environmental quality. The relationship of growth and development of sewage treatment facilities can be complex and controversial since the precise role of these facilities in the "cause and effect" cycles related to growth is not always discernable from the influence of other factors, such as accessibility, land cost, etc. It is recognized that development of sewage treatment can encourage urban development with its presence or availability, drawing development more to one area than another of otherwise equal amenity, or it can accommodate existing growth created by a complex relationship of other factors (accessibility, land ownership and development decisions, land costs, availability of utilities, environmental factors, etc.). It is this total composite of factors which has, to this point, conditioned the dynamics of growth in the Study Area, rather than the availability of sewage treatment facilities as a single determinant.

Urban development patterns within the Study Area and its distinct subunits are largely dependent on the economics of development specific to each of the unique sub-areas of the Study Area, which are widely different in nature. In order to be capable of development in areas such as Las Virgenes-Triunfo, large scale, mass development must consider marketable price structures and the market condition against necessary costs involved in site development, construction of the structures, provision of necessary utilities and access, plus a reasonable profit. When development costs exceed a reasonable marketable price or where adequate large scale sites are not available, it can be reasonable assured that large scale mass development will not occur; however, smaller scale individual and small grouped development may still occur, based on the different qualitative values and flexibility of an individual developer in responding to these opportunities.

A public improvement such as sewage treatment can cause land value to increase and in some instances, cause lower development costs through its presence/availability. This economic influence may be enough to encourage urban growth, assuming that all other needed elements such as accessibility, other services, available land, are present, such as in portions of Las Virgenes-Triunfo. In other areas, this may not be significant and other factors, such as accessibility and topography may be overriding issues in both economics and physical feasibility items. It must then be recognized that a factor of growth influence such as sewer facilities cannot be singularly described or isolated as an overriding influence in a discussion of urban growth influences in general, and in the Study Area. In the following discussion several other factors that are also related to the potential for growth in the specific subareas of the Study Area will be stressed in an attempt to place into perspective the overall growth and development of the Study Area with the implementation of the proposed facilities.

In order to view the overall Study Area, and its various subunits, within the existing context of natural and man-made factors which have conditioned, and would condition, growth inducement and the dynamics of growth, it may be useful to review previous sections of the EIS, particularly the Environmental Setting (Chapter 2) and the following maps:

- Figures 25, 29, 30, 32 & 33 - Slope, Geology, Stability, Soils
- Figures 39, 40, 41 & 42 - Jurisdictions
- Figure 48 Existing Land Use
- Figure 51 - Traffic Loadings/Capacities
- Figures 55, 56 & 57 - Gas, Electric, Water, Sanitary Sewerage
- (And others as appropriate from Chapter 2.)

Noting from this review that the Study Area is unusually diverse in topography, access and service availability, natural amenities, jurisdictions involved, and life styles represented, it can then be seen that the factors related to secondary impacts are unusually complex, vary widely within the Study Area, and are both regional and local in nature in some areas, particularly with respect to air quality, transportation, and some types of land uses (extensive regional recreation use impacts on Malibu coastal area for example). Again, it must be stressed that it is this *collection* of factors (including sewage facilities) rather than the presence or absence of sewage treatment facilities *alone* which has resulted in the growth patterns and levels of the Study Area, and that it will continue to be this complex set of factors which conditions future growth in the area - with or without the sewage facilities suggested by the Areawide Facilities Plan.

A composite picture of the natural and man-made factors which *constrain* future development in the overall Study Area is provided by Figure 61, Development Constraints. (This figure should be contrasted with the above figures which represent general factors contributing to development *potentials.*)

Development constraints are those elements of the *natural environment* (topography, slope stability, climate, hydrology, etc.) which present or inhibit development, and those aspects of the *man-made (or controlled) environment* which also prevent, inhibit or control development, such as: built-up areas; public lands; open space; zoning or land use restrictions; etc.

In Figure 61, these constraints are grouped as described below:

Extreme Constraint: combination of areas with slopes of greater than 35%; slope stability class 4; and publically held lands.

Strong Constraint: areas of slope stability class 4 less than 35% slope.

Moderate Constraint: areas of existing low or high urban density development with little "infill" opportunity, except on individual isolated parcels (rather than large vacant land areas).

The remaining areas which have not been delineated are comparatively large vacant or very sparsely developed areas having none of the above constraints, but which would otherwise be constrained for development by the availability of access through existing or potential roads, the availability of domestic water supply and other utilities, and the current quality and quantity requirements associated with these facilities (adequate road design, adequate water pressure for fire fighting, etc.).

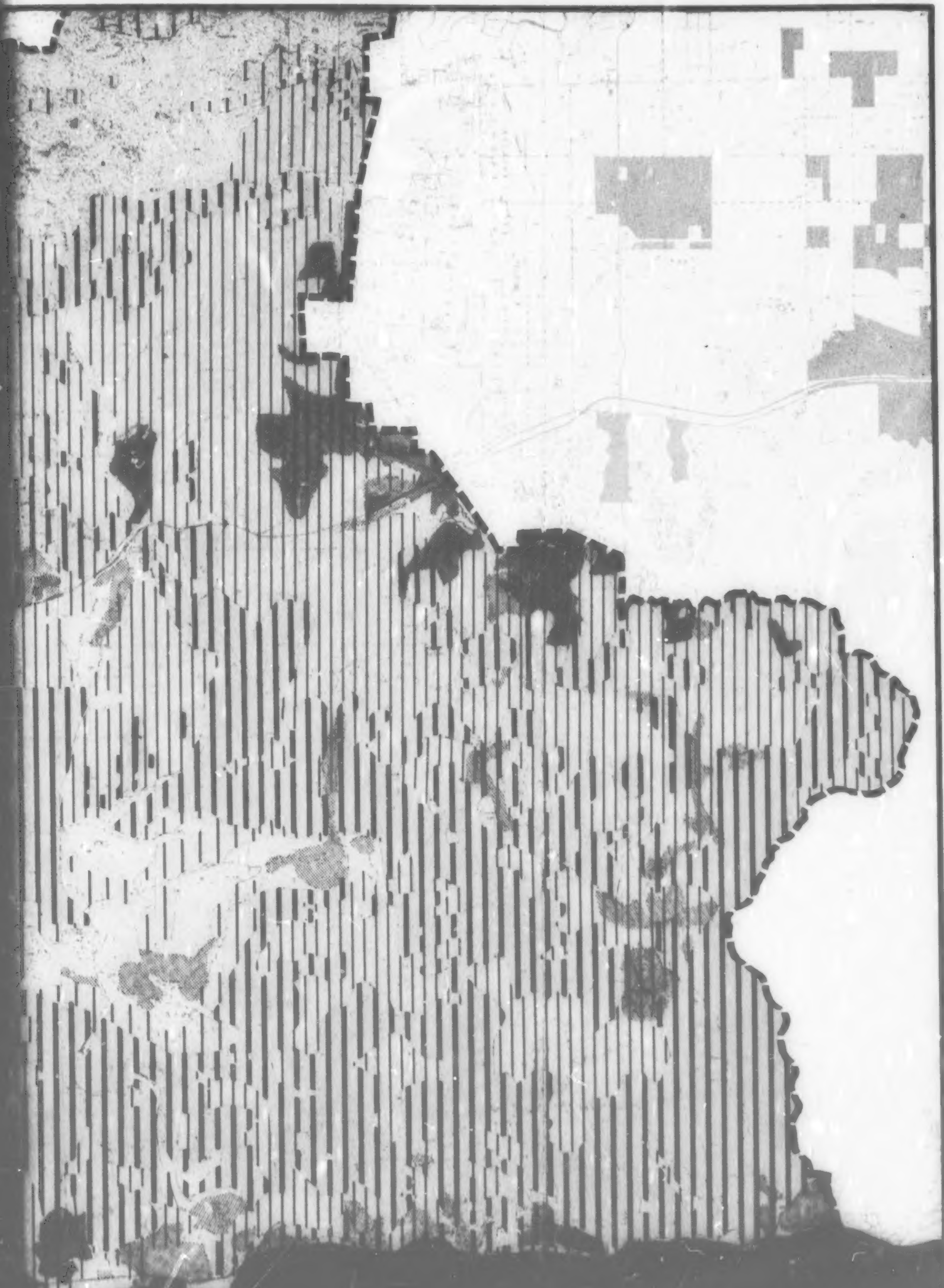
Inspection of Figure 61 clearly illustrates why much of the existing development has located where it is, and where some development has located in spite of constraints with resultant higher cost, serviceability, and environmental impacts. Additionally, areas with potential for development, which would otherwise be unconstrained by "typical" development considerations (slope, etc.) can be clearly identified. It should be noted that significant environmental constraints other than those listed in this limited analysis could apply to these areas, also rendering them environmentally unsuitable for, or extremely sensitive to, development. For example, these could involve planning policies which may be adopted by local planning agencies (L. A. County Regional Planning Commission, Ventura County Planning Department) or by the Santa Monica Mountain Comprehensive Planning Commission and/or the South Coast Region, California Coastal Commission.

Based upon this analysis, it can be seen that only areas capable of comparatively "easy" development, based upon these development constraints, are:

- "Infill" areas threaded throughout existing development in the Pt. Dume and Central Malibu areas.
- Continuing development along the Ventura Freeway, where easy accessibility, existing urbanization and infrastructure systems would enable both infill and expansion to easily occur (again assuming no policy constraints to the contrary), as well as in Las Virgenes Canyon.

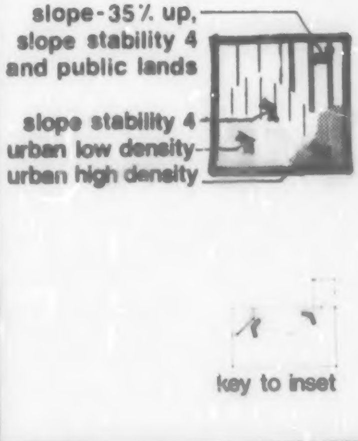
Several other low constraint areas can be seen, but other constraints such as limited or no existing accessibility to isolated canyons or valley areas, coupled with the lack of existing utility infrastructure and other factors such as land ownership patterns would make these otherwise "suitable for development" areas economically impractical by most conventional development feasibility criteria, for development in the foreseeable future, although individual exceptions would occur.

From this general analysis, it can be seen that, with few exceptions of isolated areas otherwise suitable for development, the future development of other than individual isolated areas, will continue to occur, and to impact areas, where "mass" development has historically occurred and where it is now occurring - the Coastal Malibu, Las Virgenes/Malibu Canyon, Topanga Canyon, and the Conejo Valley area (Thousand Oaks, Westlake, etc.).



EIS/EIR

Las Virgenes-Triunfo
Malibu-Topanga
Area Wide Facilities Plan



slope-35% up, slope stability 4 and public lands
slope stability 4
urban low density
urban high density
key to inset

0
1000'
5000'
2000'
0
3000'
North
Scale

development constraints

fig. 61

It is not expected that the availability of sewage treatment facilities or increased capacity at the Tapia WRF would enable the "opening up" of major new areas to development. The 8 mgd capacity of the Tapia WRF, servicing the LVMWD-TCSD areas, would accommodate less than half the "holding capacity" populations projected for those areas, which are those most feasible for development. It should be reiterated, however, that a coordinated effort of land use planning, transportation planning and utility planning (including sewage treatment) has yet to be accomplished in these areas, although current efforts by Los Angeles County, Santa Monica Mountain Comprehensive Planning Commission, and the additional studies of the AWFP/EIS processes could be linked if the appropriate coordinating entity could be identified and assigned such a role. (This type of comprehensive role is beyond both the intent and scope of the EIS process alone.)

5.1 SECONDARY IMPACTS

5.1.1 Growth Accommodation

In the LVMWD/TCSD area, the major factor influencing growth has been accessibility to and from the L.A. basin employment areas resulting from the development of the Ventura Freeway. The good accessibility that has been provided to easily developable large flat land areas has enabled suburban development to be quite feasible from physical and economic standpoints and has resulted in extraordinary growth during the 60's and 70's in this area. The commuting radius, or the amount of time an individual is willing to spend commuting, has been extended by this freeway accessibility and it has proved acceptable to commute 40 to 60 minutes from Westlake to the San Fernando Valley or to Westwood or toward downtown Los Angeles for large numbers of residents of this area.

This accessibility, combined with environmental qualities such as better air quality, climate, open space, and attractive, modern, planned communities make the area especially attractive for the more affluent that are able to afford the high costs of commuting and the relatively high cost of housing. The census data described in Chapter 2 confirms these conclusions.

The improved accessibility has also increased land values adjacent to and surrounding the freeway. The relationship of seeking freeway routes through easily developable lands, thus making these lands more accessible, and thus increasing land values, ultimately expands to the point where urban development is highly feasible. The existing land use pattern in this area is reflective of this trend, in which it can be seen that existing development has occurred, for the most part, on large flat lands in close proximity to the freeway. (See Figure 48, Chapter 2.3.3.)

It must also be noted that plans for similar future large scale residential developments in certain areas in the TCSD have received all necessary approvals for development (including amendment to the General Plan, Approved Subdivision Maps and EIRs), and are located in close proximity to freeway access. One development alone (Oak Park) is projected to be able to house a population of 15,530 persons. Another (North Ranch) is projected to be able to accommodate 17,000 people. If these population projections are, along with figures estimated for the expansion of the Bell Canyon Area (2,500 projected) and the Westlake Area (4,300 projected), added to the estimated present population of TCSD (10,500), a total potential population of approximately 49,830 could occur if the area were developed to these currently projected amounts.

At the present time, the existing domestic water trunk lines provide a basic infrastructure that enables virtually all of the highly accessible areas surrounding the freeway to join into the system. (See Figure 56.) Within the LVMWD area, the domestic water system "backbone" has been designed to be capable of servicing a population of approximately 106,000 in 1980. Similarly, areas in Ventura County within the jurisdiction of Calleguas Municipal Water District would have adequate capacity to service a population that could be expected to utilize the full capacity of Tapia WRF expanded to 8 mgd. Both of these have been designed for a population that would be considered the "ultimate" development of the area, although only some major features have been built to this ultimate capacity at present, including most local distribution systems. At the time of the initial water system design development, an ultimate population of 200,000 had been projected, however, since that time, growth has not occurred at the projected rates, and it can be expected that it may not reach this projected ultimate population.

Sewage treatment facilities and their location, size and type (or absence) do not necessarily prescribe limits on population or urban growth since there are alternatives to public sewers. It is possible that some of the areas subject to development pressure within LVMWD and TCSD areas could develop at the low densities necessary/suitable to the use of septic tanks. In general, however, the soils of the area are not suitable for widespread use of septic tanks or filter fields and, thus, this becomes a limiting factor. Another possibility is the development of small, private self-contained sewage treatment systems to serve apartment complexes or even whole tracts, such as are currently found in the Coastal Malibu area. These alternatives are probably unlikely in this location due to extra costs involved (for private developers) and the restrictions imposed (by soil limitations) for drain fields and spray irrigation suitabilities. The cost factor would be critical in the face of other rising site development costs, construction material costs and the desire to construct and market these projects to a specific economic market.

At the present time, the Tapia WRF processes a flow of 4.2 million gallons per day which represents the maximum capacity of existing solids handling/effluent disposal. Of this flow, approximately 75% (3.36 mgd) is sewage from within the U-1 and U-2 districts of the LVMWD, and 25% (.84 md) is from Triunfo County Sanitation District. The present joint powers agreement ultimately allows TCSD access to 2.35 mgd of the 8 mgd processing capacity of the Tapia WRF. This would mean that if the Tapia WRF were expanded to its capacity of 8 mgd, TCSD would be able to utilize up to 2.35 mgd, or a net increase of 180% from its present .84 mgd. Similarly, the LVMWD capacity could expand from 3.36 mgd to 5.65 mgd or a net increase of 68%, through any expansion to this 8 mgd capacity.

If these percentage increases of potential capacity were directly applied to the estimated population bases of the LVMWD-TCSD areas, it would mean that the Triunfo County Sanitation District would be capable of handling an ultimate population of 29,400 persons, or an increase of some 18,900 over the present 10,500. In LVMWD the potentially serviced population could rise to 46,900 from the present 27,900 or an increase of over 19,000 persons. This would then total some 76,300 persons that could be serviced by the joint facilities of LVMWD and TCSD, in an expanded configuration, within the geographic service areas of these two districts, or an increase of some 37,900 persons over current population levels.

The conclusion that can be drawn from these observations is that the access afforded by the freeway, the availability of an existing utility system, coupled with the availability of relatively easily developable land, and increases in land value (forcing development to offset holding costs of taxes, increasing lending costs, etc.), have been and will continue to be major forces in creating urban growth in this portion of the Study Area. The past availability of sewage treatment facilities has also contributed to this growth. The factors mentioned above (other than sewage availability) could enable growth to exceed the theoretical maximum population that could be serviced by the enlargement of the Tapia WRF and since the potential population of the TCSD area (49,830)is almost double the estimated TCSD capacity share of 29,400 persons, it would exceed it in this specific area.

While the potential population of the LVMWD area could be related to the 106,000 design capacity of the water system (or other factors), its sewage service capability at Tapia would be limited to an estimated 46,900 persons served, so that sewage service capacity for both LVMWD and TCSD is only 49% (76,300 divided by 106,000 of LVMWD and 49,830 of TCSD) of the total "possible" population of these areas, assuming no other controls on growth.

5.1.2 Changes In Land Use

If the Tapia WRF is expanded to its full 8 mgd design capacity and a population of approximately 75,000 to 80,000 is realized, it can be expected that some changes in land use could occur. As previously described, much of the study area is natural or rural open space, with existing urban uses clustered around major transportation arteries (Ventura Freeway and Pacific Coast Highway). Residential use is by far the greatest land use within these urban areas. Commercial and industrial uses are limited.

Much of the urban development has occurred in a scattered random pattern rather than cohesive development thus leaving large areas subject to infilling. As previously noted, this has been both a response to physical land characteristics, as well as the random development process. It can be expected that future development will continue this pattern.

Changes in land use due to accommodated growth from the expansion of the Tapia WRF would most likely follow this established pattern and an infilling of development would occur as well as an outward expansion of current urban areas. Thus, this development will result in some change of lands from open space to an urban use. The exact location or extent of this change cannot be predicated with any degree of accuracy, but would most likely reflect the development policies of the local planning agencies. This urban development pattern has been previously shown in Figure 49, Land Use 1990. The Los Angeles County Regional Planning Department is currently developing a number of alternative development plans which also reflect this urban development pattern in a general manner.

5.1.3. Transportation Impact

Since the primary mode of travel within the LVMWD and TCSD area is by automobile, it can be expected that the direct result of any population growth in the area will place an increased demand on the highway and local circulation systems. As previously discussed, the most probable areas subject to growth and increased transportation impact are located within the flat-land areas along the Ventura Freeway and in a few dispersed smaller areas along other arterial roads.

In 1974, the Los Angeles Regional Transportation Study (LARTS) had estimated daily vehicle miles traveled within the study area to be 1,675,500 (based on an estimated population of 37,652). LARTS has estimated the 1990 VMT to be 2,209,139 (based on a future population of 74,264). If the accommodated population of the study area with expansion of the Tapia WRF is to be approximately 76,300, it can be seen that this is slightly higher than LARTS estimates for 1990. This would mean that if 8 mgd capacity were to be attained in 1990, the total increase in VMT would be slightly greater than current VMT projections.

The projected increases in VMT will largely occur in the Triunfo area. LARTS has projected a 128% increase in the Triunfo area while the LVMWD area is projected to increase 14%. With the slightly larger potential population, which may be accommodated with the expanded Tapia WRF, these increases can be expected to be slightly larger.

This increased travel would occur primarily on the major arterial highways providing access to flat-land-areas located adjacent to the Ventura Freeway. As can be seen from Figure 51, the existing major highways within this area are presently operating below capacity with the exception of Las Virgenes Road. If the increased traffic loading were to occur as projected above, additional capacity would be required on

Las Virgenes Road and traffic loading on the other major highways could exceed their capacities, based upon the location and intensity of growth. To determine the extent of future roadway capacity needs, a detailed traffic circulation study should be undertaken by the appropriate agencies in Los Angeles and Ventura Counties which would more precisely identify points of traffic generation and distribution resulting from this anticipated "ultimate" growth potential.

5.1.4 Noise Impact

The current relative quiet nature of this area will be directly affected by the increase in population and traffic discussed in the previous sections of this chapter. The most predominant current noise source in the area is vehicular. Where traffic is anticipated to increase, it can be assumed that there will be an increase in the associated roadway noise. Generally the predicted increases in traffic will occur along the existing major highways adjacent to and connecting with the Ventura Freeway. Sound levels directly adjacent to the Ventura Freeway will continue to remain at high levels associated with a typical freeway. (See Figure 52 for estimated existing noise levels.) This flat-land-area, as a result of increased highway noise and general community noise, will take on the higher noise level characteristics typical of the more densely populated suburban setting which it will become. (Table 41 identifies typical continuous background noise levels within various types of land developments and indicates that this growth could result in a change from current levels of 40-45 dbA to the 55-60 dbA now experienced by some residential areas.) Since traffic is not expected to substantially increase in more mountainous areas, the impact to the now quiet rural areas within the mountainous regions of the LVMWD-TCSD area will be minimal.

5.1.5 Air Quality Impacts

Introduction

The manner in which air quality impact has been analyzed has been to calculate existing and potential emissions in the LVMWD/TCSD area for comparison with existing and projected emissions for the South Coast Air Basin (SCAB)[1] and to their relationship in attaining National Ambient Air Quality Standards (NAAQS). Existing and projected emissions for SCAB have been derived from studies made by the Boundaries and Forecasting Committee of the Air Quality Maintenance

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[1] SCAB refers to Ventura and Orange Counties and portions of Los Angeles, San Bernardino, and Riverside Counties.

Planning Policy Task Force and the California Air Resources Board (ARB). Existing and projected emissions for the Study Area have been calculated for both mobile and stationary sources, using vehicle miles traveled (VMT) data from Los Angeles Regional Transportation Study (LARTS), air pollution emission factors from EPA document AP-42 Compilation of Air Pollutant Emission Factors, Supplement 5 and selected emission estimates calculated by the boundaries and Forecasting Committee of the Air Quality Maintenance Planning Policy Task Force in their May 10, 1976, report entitled Preliminary Emissions Inventory and Air Quality Forecast 1974-1995.

Mobile Source Emissions

Analysis and projections of air pollution emissions is a complex process and requires use of a number of assumptions (meteorology, transportation planning, varying regulations, etc.) which can lead to significant error. A major assumption that has been made is that provisions of the Clean Air Act and its amendments regarding gradual reduction of emissions of new automobiles in succeeding model years will continue. Legislation is currently being considered in Congress (both Senate and House of Representatives) which may change this timetable. California has established its own emission standards which are more stringent than Federal standards. It is assumed that due to the severity of the air pollution problem in California, these standards will be maintained.

The method that has been utilized to analyze and describe potential emissions of mobile sources has relied upon application of emission factors (appropriate with vehicle type and developed by EPA) to calculations of vehicle travel (vehicle miles traveled). These emission estimates are gross estimates of potential trends and should not be used as hard fact. The method used to calculate emission is:

Vehicle Miles Traveled By Vehicle Type x Composite Emission Factors by Vehicle Type = Emissions for Vehicle Type

a. VMT Estimates

VMT projections were obtained from the Los Angeles Regional Transportation Study (LARTS). The LARTS estimates for daily VMT within the Study Area in 1974 indicates a level of

1,675,000 daily VMT (Table 12) based upon travel patterns for each LARTS analysis zone within the Study Area. The 1974 VMT estimates were cross-checked with California Department of Transportation freeway traffic counts and found to be comparable.

For comparison purposes and to present a range of possibilities, VMT projections of the 1990 potential accommodated population were calculated for two possible situations. One situation assumes that existing travel patterns and vehicular use will continue rather than decrease. The other situation assumes that improvements will be made to transportation facilities and assumes growth resulting in more mixed land use and increased use of transit facilities. In essence, the latter situation assumes implementation of mitigation measures.

Projected VMT for 1990 with potential accommodated population and which also assumes continuation of existing travel patterns, has been estimated to be 3,173,534. These estimates have been prepared using appropriate VMT per capita factors according to geographic location and selected future year. Projected 1990 VMT with accommodated population and assuming less vehicular use has been estimated to be 2,321,837. LARTS has estimated 1990 VMT to be 2,209,139 at a population of 74,264. See Table 51.

Table 51

Comparison of Estimated 1990 VMT and Accommodated Population VMT

	Accommodated 1990 Population w/Tapia WRF	VMT With Accommodated Population w/Existing Patterns	VMT With Accommodated Population w/Less Vehicular Use	LARTS 1990 Population	LARTS 1990 VMT
LVMWD	46,900	2,468,816	1,772,351	43,000	1,624,935
TCSD	29,400	704,718	549,486	31,264	584,204
Totals	76,300	3,173,534	2,321,837	74,264	2,209,139

1. Based on 1974 LARTS VMT per capita of 52.64
2. Based on 1990 LARTS VMT per capita of 37.79
3. Based on 1974 LARTS VMT per capita of 23.97
4. Based on 1990 LARTS VMT per capita of 18.69

The calculated VMT totals have been apportioned according to vehicle class designations utilizing proportion factors of the Southern California Air Quality Maintenance District (SCQMD) and the California Air Resources Board (ARB) in their role as assistants to the Boundaries and Forecasting Committee. The total VMT, the vehicle class apportions and roadway useage are shown here:

		1974 VMT	
Vehicle Class	**Proportion**	**Freeway**	**Other Roads**
Light Duty Gas Powered	92.33%	1,298,477	248,512
Heavy Duty Gas Powered	2.99%	42,050	8,048
Heavy Duty Diesel Powered	3.76%	52,879	10,120
Motorcycles	.92%	12,938	2,475
Totals		1,406,344	269,156

Total = 1,675,500

		VMT With Accommodated Population & Existing Travel Patterns	
Vehicle Class	**Proportion**	**Freeway**	**Other Roads**
Light Duty Gas Powered	92.33%	2,461,305	468,819
Heavy Duty Gas Powered	2.99%	79,706	15,183
Heavy Duty Diesel Powered	3.76%	100,233	19,092
Motorcycles	.92%	24,525	4,671
Totals		2,665,769	507,765

Total = 3,173,534

Vehicle Class	Proportion	VMT With Accommodated Population & Lesser Vehicular Use Freeway	Other Roads
Light Duty Gas Powered	92.33%	1,564,949	578,813
Heavy Duty Gas Powered	2.99%	50,679	18,744
Heavy Duty Diesel Powered	3.76%	63,730	23,572
Motorcycles	.92%	15,593	5,767
Totals		1,694,941	626,896

Total = 2,321,837

These VMT estimates were converted to emissions in tons/day by applying emission factors as published in EPA publication AP-42 Supplement 5 for the years 1974 and 1990.[1] The emission factors have utilized both exhaust, crankcase and evaporations emissions as well as speed corrective factors judged appropriate to roadway and Study Area conditions and also assumes 3.3 trips per day per vehicle. The formula utilized is shown here:

$$E = VMT \times CEF \times 1.1023 \times 10^{-6}$$

where E = Emissions in tons per day
VMT = Vehicle miles traveled by vehicle class and roadway.
CEF = Composite emission factor in grams/miles according to vehicle class, speed correction, and with crankcase and evaporation factors added.
1.1023×10^{-6} = Conversion factor, grams to tons.

Speeds selected for the differing roadways in 1974, 1990 with existing travel patterns, and 1990 with less vehicular use were based on judgement of existing average conditions and assumptions that population increases would increase traffic congestion thereby lowering speeds. Speeds deemed appropriate for 1974 were 50 mph for freeway travel and 40 mph for other roads, whereas the 1990 case with existing travel pattern speeds were estimated to be 40 mph for freeway travel and 20 mph for other roads. The 1990 case with less vehicular use utilized speeds of 45 mph for freeway and 25 mph for other roads. The substantial lowering of speeds in 1990 for other roads was a result of the substantial increases in VMT for both the 1990 possibilities.

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[1] Composite emission factor calculations were provided by Environmental Research and Technology, Inc., Santa Barbara, and were extrapolated above 45 mph from AP-42 data.

Table 52 lists estimated vehicle emissions for 1974 and both 1990 possibilities. Detail calculations, including sub-area data, are included in an appendix. Other mobile sources such as jet and piston aircraft, railroads, ships, off-road vehicles, etc., were not included in the mobile source emission estimates in order to draw simple comparison; however, one could conclude that these would increase proportionately to population increase.

Table 52
Estimate of Projected Mobile Emissions
In Study Area In Tons/Day

			Emissions	
1974 Vehicle Emissions	VMT	CO	THC	NO_x
Freeway Travel (50 mph)	1,406,344	43.47	6.34	8.87
Other Roads (40 mph)	269.156	9.55	1.38	1.60
Total	1,675,500	53.02	7.72	10.47
1990 With Existing Travel Patterns				
Freeway Travel (40 mph)	2,665,769	12.39	2.38	6.23
Other Roads (20 mph)	507,765	4.72	.72	.99
Total	3,173,534	17.11	3.10	7.22
Net Reduction from '74		68%	60%	31%
1990 With Lesser Vehicular Use				
Freeway Travel (45 mph)	1,694,941	7.26	1.39	4.06
Other Roads (25 mph)	626,896	4.63	.84	1.31
Total	2,341,834	11.89	2.23	5.37
Net Reduction from '74		78%	71%	49%

Stationary and Area Source Emissions

Stationary sources are non-vehicular sources of air pollution and include such items as gas stations, refineries, dry cleaning establishments, industrial plants, or any facility where combustion of fuels or evaporation of organic solvents may occur. Area source emissions include sources such as wild fires, farming operations, construction and demolition, unpaved roads, etc.

In order to estimate stationary and area source emissions for the Study Area, various types of stationary sources appropriate to the Study Area were selected from the Preliminary Emissions Inventory and Air Quality Forecast 1974-1995 prepared by the Boundaries and Forecasting Committee for the SCAB. In this study, data for stationary source emissions was presented according to total emissions in the SCAB and was broken down further by County. The data was not further disaggregated and it has thus been necessary to develop a per capita factor, according to County, to develop estimates of stationary source emissions within the LVMWD/TCSD study area. This methodology for estimating stationary source emissions is somewhat limited since emission estimates based on population rather than land use can be misleading if the stationary sources, physically, are not within the study area. However, people do, in fact, consume various goods and services which can result in pollution but may be emitted in a remote area. For example, there are no jet airports within this Study Area, but it would be reasonable to assume that the population of the Study Area would use airports in other parts of the SCAB. Thus, the population of the Study Area must accept responsibility for a proportionate quantity of this type of pollutant emission. In the calculations presented here, categories of emission sources of this nature (petroleum production and refining, industrial processing, power plants, waste burning, airport useage, railroad useage, etc.) have not been included so simple comparisons specific to the types of stationary sources that may be found in the Study Area and also the SCAB may be made rather than attempt highly complex gravity models or use-allocation studies that may not be accurate for this situation.

The Study Area Stationary Source Emissions (Total Hydrocarbons - THC) in tons/day for 1974 and 1990 are as follows:

Study Area Stationary Source Emissions-Total Hydrocarbon In Tons/Day

Sub-Area	1974 Population	THC tons/capita	THC Emissions
Las Virgenes	26,960	.000067	1.8
Triunfo	10,692	.000055	.59
		1974 Total	2.39 tons/day

Sub-Area	Accommodated 1990 Population	THC tons/capita	THC Emissions
Las Virgenes	46,900	.000064	3.00
Triunfo	29,400	.000056	1.65
		1990 Total	4.65 tons/day

Specific calculations used to arrive at these estimates are included in the appendix.

Conclusion

The total estimated air pollutant emissions (mobile plus stationary) are shown on Table 53. As can be expected, pollutant emissions decrease substantially in the future and more so if vehicular use also decreases. The primary reason for the decrease is the use of better emission controls on newer automobiles and the gradual decrease in the use of older, more polluting vehicles.

When these expected decreases are compared with the anticipated decreases for the entire SCAB, (See Table 54) as estimated by the Boundaries and Forecasting Committee, it can be seen that the decreases that are possible in the Study Area, even with the accommodated population, are even greater than expected for the SCAB, with the exception of NO_x . Greater NO_x reductions are expected in SCAB than in the Study Area.

Table 53
Comparison of Estimates of Total Air Pollutant Emissions

1974 Estimated Total Air Pollutant From Study Area

Source	Emissions in Tons/Day		
	CO	THC	NO_x
Mobile	53.02	7.72	10.47
Stationary		2.39	
Total	53.02	10.11	10.47

1990 Estimated Total Air Pollutant Emissions With Existing Travel Patterns From Study Area

Source	Emissions in Tons/Day		
	CO	THC	NO_x
Mobile	17.11	3.10	7.22
Stationary		4.65	
Total	17.11	7.75	7.22
Net reduction from 1974	35.91 (68%)	2.36 (23%)	3.25 (31%)

1990 Estimated Total Air Pollutant With Less Vehicle Use From Study Area

Source	Emissions in Tons/Day		
	CO	THC	NO_x
Mobile	11.89	2.23	5.37
Stationary		4.65	
Total	11.89	6.88	5.37
Net reduction from 1974	41.13	3.23	5.1

Table 54
Estimated Air Pollutant Emissions for SCAB[1]

1974 Estimated Total Air Pollutant Emissions

	Emissions in Tons/Day		
Source	CO	THC	NO_x
Mobile[2]	6,250	752.75	937.75
Stationary[3]		412.3	
Total	6,250	1,165.05	937.75

1990 Estimated Total Air Pollutant Emissions

	Emissions in Tons/Day		
Source	CO	THC	NO_x
Mobile[2]	2,188	723.5	390.8
Stationary[3]		604	
Total	2,188	1,327.5	390.8
Net change from 1974	4,062 (65%) reduction	162.4 (14%) increase	546.95 (58%) reduction

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1. 1974 Mobile Source Emissions interpolated from ARB 1973 and 1975 estimates.
2. Includes: Light Duty Gas Powered Passenger, Light Duty Duty Gas Powered Trucks, Heavy Duty Diesel Powered Trucks, and Motorcycles.
3. Includes: Petroleum Marketing, Organic Solvent Use, Combustion of fuels by other industrial and combustion of Fuels Domestic and Commercial.

If there were no population increase in the Study Area beyond 1974 levels and continued control regulations implemented for vehicular emissions, a considerably greater reduction in emissions could be realized. In order to compare this case with the cases described above, a similar calculation has been developed, but with use of 1974 population based travel and 1990 composite emission factors. The result of this calculation is shown here:

	1990 Study Area No Growth Emissions in tons/day		
Source	CO	THC	NO_x
Mobile	6.85	1.33	3.96
Stationary[1]		4.05	
Total	6.85	6.41	3.96
Net Reduction from 1974 tons/day	46.17	3.7	6.51
(percentage)	(87%)	(37%)	(62%)

When this 1990 "No Growth" case for the Study Area is compared with 1990 Estimates for the SCAB, it is found that reductions of each pollutant would be greater in the Study Area than in the SCAB.

It should be noted that in the May 10, 1976, report of the Boundaries and Forecasting Committee, Preliminary Emissions Inventory and Air Quality Forecast 1974-1995, the estimated 1990 ambient air quality based upon their 1990 estimated emissions for the SCAB would fall below Federal standards (NAAQS). These levels and the NAAQS are shown here:

	Ambient Air Quality Level			
	Oxidant[2] (Max 1 hr. average)	CO (8 hr. average)	NO_2 (Max 1 hr. average)	Particulate (Annual Geometric Mean)
1990 SCAB Levels	.34 to .42 ppm	17 ppm	.46 ppm	138 ugm/m^3
NAAQS	.08 ppm	9 ppm	.05 ppm	75 ugm/m^3

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1. Due to stationary source emissions being based on population, these remain the same as 1974.
2. Hydrocarbon emissions are major precursors in formation of oxidants.

It can thus be seen that even larger reductions in emission are going to be required than what has been estimated for SCAB to achieve NAAQS. The population accommodation and distribution associated with this project does not help to provide this reduction, thus, measures to mitigate these emissions must be pursued. It must be reiterated, however, that most of the mitigation measures, as well as the responsible agencies/entities, are not within the direct responsibility or control of LVMWD/TCSD and that joint efforts of all concerned agencies would be required to accomplish significant changes in air pollution sources and levels.

6.0 IMPACT OF NO ACTION

6.1 INTRODUCTION - DEFINITIONS OF NO ACTION

The definition of "no action" often varies widely among environmental impact analyses (EIS/EIR) based upon the nature of the proposed action that is the subject of the analysis.

When a specific proposed action is the subject of a detailed analysis, the "no action" alternative may actually represent either no action of any sort at any time, or no action pending possible later development and substitution of a more viable and environmentally suitable alternative which might be developed upon further study, creation of new technologies, or the change of other factors affecting the project. Thus, "no action" can be time-constrained. ranging from "later" to "never".

A second type of "no action" is represented by the change in definition, scope, or "sponsorship" of a project which would mean that an action might still be undertaken in a different manner or scale, and by a different party, or combination of parties, even though there is, in principle, "no action" with respect to the originally proposed action being advanced or implemented. (Local funding rather than federal or state funds.)

Also, "no action" can, as described above in the first paragraph, represent the delay or omission of the final "irretrievable" step of a proposed project or action, typically the commitment of monies, labor and materials to construction or other implementation activities which cannot be reversed in terms of their alteration of the environment. In this case several interim actions could have taken place (planning, engineering, site analysis, costing, etc.), most of which would not materially alter the environment covered by the proposed action. (Delays awaiting funding source resolution implementing agency creation, agreements.)

The "no action" situation described here assumes that, for whatever reasons, all existing conditions, responsibilities and agreements pertaining to spray disposal of effluent and solids handling and disposal at the Tapia WRF would continue, without the Calabasas Reclaimed Water Line or the Sampo-Hope Property Solids Disposal alternatives. Normal maintenance and minor improvements to existing facilites would continue, but only in order to maintain current service level requirements (1977) and commitments already in force.

Thus the Tapia WRF processing capacity would remain at approximately 4 mgd; current sludge disposal practices would continue; spray disposal of effluents would continue; and operations would remain at present levels.

6.2 IMPACT OF NO ACTION FOR THE CALABASAS RECLAIMED WATER LINE

A "no action" alternative would tend to cause additional stress to be placed on the ability of LVMWD to dispose its reclaimed water from its Tapia Water Reclamation Facility. The LVMWD presently does not have a permanent method of disposing of spray effluent. Instead, it has only limited commitments by both private and public landowners which permit (and also purchase) reclaimed water for spray irrigation on their lands. At this time, the LVMWD is able to spray irrigate approximately 980 million gallons of reclaimed water per year[1] on approximately 332 acres. Of this quantity, approximately 329 million gallons are purchased by private users and the remainder may be considered waste disposal (under agreements that have been made, much of this waste disposal water is actually used for agricultural purposes, but is basically given freely to the private user after a specific quantity has been purchased).

The basis problem with this method of use and disposal of reclaimed water is that there is limited land suitable for spray irrigation (due to geologic constraints and land availability) in the Las Virgenes/Malibu Creek Valley. Additionally, there is also the possibility that landowners could decide to use lands for purposes other than agriculture and discontinue the spray irrigation of their lands.

Recently, the State Department of Parks and Recreation informed the District that after December 1978, 110 acres of State owned land, currently used for spray irrigation, would no longer be available. Additionally, the State Department of Parks and Recreation is in the process of acquiring the Hunter property (of which 32 acres are currently being sprayed) for inclusion in the Malibu Creek State Park.

The Claretville Farms (Claretian Seminary) is also being considered by the Parks and Recreation Department as additional parkland for the Malibu Creek State Park. This farm, a large user of reclaimed wastewater for sudan grass on permanent pasture land, is approved for acquisition in the 1977-78 State Budget. If the State should acquire the Claretville Farm, the land use would change from a farm to park land with possible overnight facilities for campers, environmental study areas, and possibly hostel and dormitory areas. The Farm uses approximately 64 acres of its 214 acres for spray irrigation. This could be lost to the District in the future. Additional acreage that will be lost to the District by 1978, is the 53 acre Rondell property. With the loss of the Rondell property, the potential loss of this Claretville land and the other State owned land, the District could lose approximately 258 acres of spray irrigation area.

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[1] Waste sprayed in 1976, an additional 458 million gallons were disposed by creek discharge.

If the availability of land and landowners who permit spray irrigation of effluent on their lands diminish in the future, and LVMWD is not able to spray irrigate all of the reclaimed water it produces, it will then be necessary to find alternative means to dispose of the reclaimed water. This could mean that alternatives such as year-round disposal to Malibu Creek, an ocean outfall, or disposal into adjoining river systems would receive greater consideration. (These alternatives will continue to receive study in the preparation of the Draft Addendum to the AWFP and EIS/EIR.)

The impact of "no action" would also mean a continued reliance on available imported freshwater for irrigation of the Calabasas Golf Course and orchards and greenbelts. This use of imported freshwater amounts to as much as 1,000 acre-feet annually which would be the equivalent use of 8,927 persons using 100 gallons/day for one year. The continued use of the freshwater solely for a specialized recreation use could be considered an extravagant use of a limited resource and cannot be conceived of as vital necessity. This would not only be of concern at times of drought, but would also be of concern at other times since LVMWD would have useable reclaimed water nearby.

Additionally, the energy required to pump imported freshwater would also be greater than the pumping of reclaimed water from the LVMWD reservoir to the Calabasas Golf Course. Using gross estimates based on a power consumption of 1 Kwh per acre-foot per foot of lift, it can be estimated that freshwater pumped from Northern California to Southern California (West Branch-California aqueduct) requires 3,160 Kwh per acre-foot. The pumping of the reclaimed water from the LVMWD reservoir to the Calabasas Golf Course has been similarly estimated to be 1,143 Kwh per acre-foot. The "no action" alternative would thus consume additional freshwater as well as consume greater quantities of energy.

6.3 IMPACT OF NO ACTION ALTERNATIVE ON THE SLUDGE DISPOSAL ELEMENT

A "no action" alternative for the Sludge Disposal element of the AWFP would indicate that current solids handling capacity and disposal practices would continue, and the Tapia Plant could be limited to processing only 4 mgd.

As previously discussed, the Tapia WRF had been designed to handle 8 mgd, but its solids handling portion was held to 4 mgd in order to resolve the uncertainties of disposal systems at that time, and to seek improved methods to effectively dispose of domestic sludge.

Present studies have been prepared to evaluate sludge disposal methods and develop a system that gives LVMWD long-term control over the disposal of dewatered sludge. A "no action" alternative would cancel the effort that sought to find an adequate method of sludge disposal for the amount of sludge processed.

Currently, the District pays a private user (Sampo Ranch) a fee of $12.00 per load of sludge as a method to dispose of the sludge. The user spreads the sludge on open ground for drying, and then utilizes it as a soil amendment on pastureland. Although this method of sludge disposal and reuse as a soil amendment may be able to continue in the future, it is a system that is not under control of the LVMWD; it is subject to land use changes; it is subject to land ownership changes; fee structures are uncertain; and finally, total land availability that is adequate for this type of process is limited in the Las Virgenes Valley. The farming operation of the Sampo Ranch is conditioned by the annual lease arrangement between the leasee and the property owner, and is thus not a dependable long-term solution.

As a back-up system during wet weather, the District trucks the sludge to the Calabasas Landfill for disposal. This method can be utilized in dry weather periods also, although in total, it is more expensive than paying a landowner for disposal of the sludge. A further disadvantage of this system is that it does not reuse the sludge for any beneficial purpose, as occurs when selling the sludge to a landowner. Continuation of this process would also incrementally use the available capacity of the Calabasas Landfill. The estimated life span of the landfill varies from 30-50 years (depending upon the variables), and although the amount of sludge disposed at the site would be minimal (less then

.002% of the remaining capacity of Calabasas), the sludge would not be used towards any beneficial purpose.

If there were a "no action" alternative, and the District chose to increase the solids handling capacity of the Tapia plant, LVMWD and TCSD would then have to finance the upgrading of the plant with local funding, since the chance to utilize State and federal funding would be eliminated. This action, however, could cause significant increases in the bonded indebtedness of the various implementing entities involved.

With the population increases now being realized in the LVMWD and TCSD districts, a "no action" alternative would create a potential problem in servicing new connections. It is possible that the District may not be able to accept additional customers, and a sewer moratorium or similar control could be instigated by the District, or the wastewater and sludge disposal permit agency, the RWQCB. However, this type of action is not recommended by the LVMWD Board of Directors or RWQCB. LVMWD's policy is to adequately treat all sewage received at the Tapia plant. If they are not able to properly and adequately treat all of the incoming sewage, the District has two options. One, they can inform the Los Angeles and Ventura County Regional Planning Departments that they are operating at capacity and, as such, are unable to meet additional hook-up demands. This then would indicate that new developments would have to seek alternative means of providing sewage treatment facilities for the proposed projects (new special districts, package treatment plants, septic tanks, etc). Or two, if, as a result of an overcapacity situation at the plant, the District violates permitted disposal practices instituted by the RWQCB, a connection ban could be activated by the Board. This would occur only as a result of discharge violations, such as unpermitted disposal of wastewater to Malibu Creek, or the District's inability to adequately dispose of sludge in a permitted disposal site.

In summary, a "no action" alternative will not resolve the immediate problems of long-term control by the District over the disposal and use of reclaimed water and dewatered sludge. It could also delay and complicate the planning process of the AWFP and the subsequent Draft Addendum by not implementing these elements that are part of a complete area wide sewage management plan. Additionally, "no action" could mean:

- Loss of potential land for disposal or reuse of effluent and sludge

- Loss of available Federal and State funds
- Greater land costs in the future
- Possible moratorium within the Districts' service area, and
- Tapia may not be able to maintain the current level of treatment which could cause regional water quality standards to be violated.

7.0 Potential Mitigation Measures

7.0 POTENTIAL MITIGATION MEASURES

7.1 EPA RELATIONSHIP TO MITIGATION MEASURES

EPA has special responsibilities to assure that adverse impacts are eliminated or minimized to the maximum extent possible through mitigation measures in cases where federal statutes, executive orders and regulations would be contravened. For example, increased emissions from additional vehicle use (accommodated by an EPA funded project) that would prevent the mandated attainment of regional air quality standards is an impact which is the concern of EPA. It is beyond the scope of the EIS process to detail planning necessary for the immediate implementation of each proposed mitigation measure. EPA believes that it is the local governments which should determine which measures are appropriate to specific circumstances.

The total responsibility for developing detailed mitigation measures during the remaining planning and impact analysis efforts rests upon LVMWD, TCSD, and their consultants, as well as appropriate local planning agencies. It is EPA's position that only local agencies are capable of developing detailed mitigation measures appropriate to the differing circumstances in each community. EPA will not select specific measures for each city or local area within a larger district. EPA views its role to be that of providing guidance in the development and analysis of such measures and, in the end, determining the extent of benefit of such measures in reducing the accommodated impacts associated with grant-funded projects.

Finally, NEPA and CEQA require development and consideration of mitigation for all project impacts (geology, recreation, aesthetics, etc.) - primary and secondary - i.e., those that don't fall under federal jurisdiction. Implementation of these or other equally effective measures are left for local, regional and state agencies as they deem necessary.

Mitigation measures have been discussed here in terms of their short and long-range, and direct and indirect impacts for implications for all alternatives,, as they apply to construction and operation activities. Discussions of potential mitigation efforts appear throughout Chapters 4.0, 5.0, 6.0, 8.0, 9.0 and 10.0, and are summarized in general form in this chapter, with a description of possible implementing agencies.

7.2 DIRECT IMPACTS-CONSTRUCTION (SHORT-TERM) AND MITIGATION

The following listing of direct impacts related to the construction process and timing is taken from Chapter 4.0 and lists impacts common to both projects, as well as those specific to individual alternatives. No ranking or other emphasis is implied by the listing sequence. The related mitigation measures (or necessary steps leading to their definition) for these impacts are also listed along with the entity or entities which would be responsible for implementation of the mitigation measures.

LVMWD/TCSD have the capability to mitigate all of the potential primary or direct impacts associated with the construction and operation of any of the alterntives, either in large measure or entirely, through proper analysis, planning and design of all factors described here in the continuing AWFP/EIS process, and in subsequent detailed design document development and construction implementation, along with continuing monitoring, supervision and stringent enforcement during construction.

None of these direct impact mitigation measures are beyond current state-of-the-art capabilities to analyze and develop protection, avoidance, or remedial measures as part of the design and implementation processes and any "possible" impacts are based upon assumptions which will require factual validation in more detail as part of continuing planning efforts to even determine their probability of occurring. Thus, not all of these suggested impacts may occur.

7.3 DIRECT IMPACTS-OPERATION (LONG-TERM) AND MITIGATION

A mitigation measure which could relieve the pressure of urban growth upon the development and operation of wastewater collection and treatment is the conservation of water in all uses, but particularly in domestic use. Although there appears to be adequate potable water supply facilities available to service future urban growth within the study area, a comprehensive water conservation program would reduce demand on imported water, conserve energy and provide more efficient use of wastewater collection and treatment facilities. Reduction in the total volumes of wastewater generated would reduce the quantity of treated effluent to be disposed or reclaimed. This reduction would then generally lessen the environmental impacts from the operation of the wastewater treatment system alternatives being discussed. In order to estimate the need and sizing of wastewater

Table 55

MITIGATION MEASURES FOR DIRECT CONSTRUCTION IMPACTS
CALABASAS RECLAIMED WATER LINE

IMPACT	MITIGATION MEASURE	RESPONSIBLE ENTITY
Air Quality & Noise		
1. Direct noise from construction.	Noise abatement devices required on all construction vehicles.	Contracting Agency (LVMWD) and Construction Contractors.
2. Dust generated by construction activities	Use of typical wetting and other dust/debris control measures.	Contracting Agency (LMVWD) and Construction Contractors.
Geology/ Seismicity and Soils		
3. Alteration of topographic conditions by excavation for pipeline and storage reservoir	Utilize appropriate grading techniques, compact backfill, and proper disposal of excess excavation materials.	Contracting Agency (LVMWD) and Construction Contractors.
4. Drilling, light blasting of rock if unavoidable by siting and location of facilities	Blasting controlled to confine blasted rock material to immediate area.	Contracting Agency (LVMWD) and Construction Contractors.
Biota		
5. Possible disturbance to oak woodland habitat	Avoid disturbance of main root crown immediately around trunk,	Contracting Agency (LVMWD) and Construction Contractors.

		minimization of heavy equipment beneath trees, stockpiles deposited at a maximum distance from trunks. If disturbance is unavoidable, trees should be pruned by amount proportional to root loss. Activities around trees should occur during tree's lowest activity period (Sept. or Oct.) and be supervised by qualified oak specialist.	
6.	Disturbance to wildlife population	Construction should occur outside of primary wildlife breeding season. (April to June).	Contracting Agency (LVMWD) and Construction Contractors.
7.	Erosion caused by removal of vegetation and cut and fill activities	Minimal removal of vegetation, minimum cut and fill activities, reseed exposed soil promptly after construction with fast growing species.	Contracting Agency (LVMWD) and Construction Contractors.
8.	Increased fire hazard potential from construction	Use spark dampers on equipment, stockpile water, tools, clear debris, schedule construction activities within high risk areas in cool weather seasons.	LVMWD and Construction Contractors.

Archaeological		
9. Alteration, destruction of archaeological resources along the Alternative C route.	Placement of water line in existing dirt roadway and/or planned subdivision road. If this is not possible, placement of line on top of ground or upslope of sensitive areas, or placing added fill to protect sites and graded accordingly. The site may also be salvaged if necessary prior to construction.	LVMWD/TCSD and construction contractors with approved archaeologist.

TABLE 56

MITIGATION MEASURES FOR DIRECT CONSTRUCTION IMPACTS
SOLIDS HANDLING

IMPACT	MITIGATION MEASURE	RESPONSIBLE ENTITY
Air Quality & Noise		
1. Direct noise from construction	Control by use of approved muffled equipment/muffling techniques	Contracting Agency (LVMWD) and Construction Contractors
2. Dust and air pollution generated by construction activities	Use of typical wetting and other dust/debris control measures, use of efficient operating equipment with pollution control devices, where appropriate.	Contracting Agency (LVMWD) and Construction Contractors.
Geology & Soils		
3. Alteration of topography by excavation for pipeline (All alternatives except Calabasas Landfill.)	Use naturalized grading techniques, equalize cuts and fills, use existing road pipeline right-of-ways.	Contracting Agency (LVMWD) and Construction Contractors.
4. Alteration, erosion of soils resulting from excavation, grading, backfill (All alternatives except Calabasas Landfill.)	Any backfilling should be done with care to maintain original soil horizons. Revegetation should be accomplished to conform to original conditions. Work scheduling of excavation and any earthwork should avoid rainy seasons.	Contracting Agency (LVMWD) and Construction Contractors.

Biota		
5. Possible disturbance to oak woodland habitat (All alternatives except Calabasas Landfill.)	Avoid disturbance of main root crown immediately around trunk, minimization of heavy equipment beneath trees, stockpiles deposited maximum distance from trunks. If disturbance is unavoidable, trees should be pruned by amount proportional to root loss. Activities around to trees should occur during tree's lowest activity period (Sept. or Oct.) and be supervised by quantified oak specialist.	Contracting Agency (LVMWD) and Construction Contractors.
6. Increased fire hazard potential from construction activity.	Use spark dampers on equipment, stockpile water, tools, clear debris, schedule construction activities within high risk areas in cool weather seasons.	Contracting Agency (LVMWD) and Construction Contractors.
Archaeological Resources		
7. Possible additional disturbance to LAn 229 site by slurry pipeline (All alternatives except Calabasas Landfill.)	Study LAn 229 site and proposed pipeline in detail, reroute construction and/or perform archaeologic salvage operations as necessary.	LVMWD/TCSD, and State Department of Parks and Recreation and approved archaeologist.
Traffic		
9. Disruption of traffic on Las Virgenes Canyon Road and Mulholland Highway.	Minimize construction activity during peak hours, use traffic control, detour planning.	Contracting Agency (LVMWD), Construction Contractor, L.A. County Sheriff and California Highway Patrol.

collection and treatment facilities, a general rule of thumb is to utilize a quantity of 100 gallons per capita. If useage can be held to less than this amount, a significant reduction in impact could be realized.

The amount of water used in the typical household, commercial or industrial use varies with location, types of appliances or equipment, number of occupants, etc., but generally it can be assumed that about 50% of per capita water use eventually ends up in sewers for treatment while the remainder is runoff to streams, oceans, and/or lost by other means (evaporation, absorption, etc.). Typical examples of water use by various appliances and fixtures in the home are as follows:

Water closets (toilets)	5 to 7 gallons per flush
Shower	5 to 19 gallons per minute
Bath	25 to 30 gallons
Automatic clothes washers	20 to 45 gallons per load
Automatic dishwashers	6 to 25 gallons per load

With useage of more efficient appliances and fixtures, a significant reduction in wastewater generation could result. New types of water closets and devices to restrict flow and modify size are readily and currently available which reduce water useage to 3 gallons per flush and 3 gallons per minute for showers. Other more advanced equipment is also being developed and is in use in other countries of the world and will probably be available in the U.S. shortly. Any new urban development could easily utilize this type of low water useage equipment and in addition, available retrofit devices could be installed in existing homes. The economies of total water useage could be substantial since, for example, the reduction in water useage from more efficient water closets alone is approximately 50%.

Reduction could also be achieved in the volume of wastewater solids entering treatment plants and would result in: improved treatment; less volume requirements for sludge treatment and disposal; and related energy savings. One of the simplest means for reduction of the solids loads is the reduction in the amount of food scraps and garbage that is disposed through waste grinders (garbage disposals). Most of the material is suitable for use in backyard composting and could be disposed of as a soil amendment under most conditions.

Implementation of a wastewater flow reduction/water conservation program would require the cooperative efforts of a number of local agencies and governmental bodies. Assembly Bill 2114, signed by the Governor on September 18, 1975, adds Section 71610.5 to the Water Code to read: "A district may undertake a water conservation program to reduce water use, and may require, as a condition of new service, that reasonable watersaving devices and water reclamation devices be installed to reduce water use." Plumbing and building codes have been amended to allow the use of low-flow devices. Also, Assembly Bill 1395, signed by the Governor on April 2, 1975, states that: "After January 1, 1978, no new hotel, motel, apartment house or dwelling shall be constructed which employes a tank-type water closet that uses more than a maximum of 3 1/2 gallons of water per flush, and which is not approved by the department as meeting adequate standards of safety and sanitation."

There are numerous reduced-flow toilets available, some of which use no water but rely upon incineration, oil carriage, or composting. Air pressure and vacuum systems have also been utilized. A 0.5 gallon/flush toilet costs about $380 more than a conventional 5-6 gallons/flush toilet because it requires the use of an air compressor. However, the compressor can operate more than one toilet, reducing the cost for additional toilets. The low volume flush toilet previously described was a shallow trap water closet which uses 3-3.5 gallons per flush. These cost only $8 to $15 more than the standard water closet but could save almost 21,000 gallons of water per year which would cost about $13 to purchase. Thus, installation would be amortized to the homeowner in one-two years based upon water savings alone.

Installation of shower controls, inserts which are plastic orifice-type devices mounted behind shower heads, can reduce flows by 50-67 percent with an average savings of about 60 percent. These cost only $1.50 each and could result in savings of almost 17,000 gallons of water per year for the typical family; thus, would pay for itself within a month.

The following table identifies direct impacts and related mitigation measures related to the operation of any and all alternatives and follows the same format as used previously in the discussion of direct construction impacts. In many instances the use of water conservation mitigation measures would lessen the degree of impact; however, in general the type of impact would remain similar.

TABLE 57

MITIGATION MEASURES FOR OPERATIONAL IMPACTS

CALABASAS RECLAIMED WATER LINE

Impact	Mitigation Measure	Response Entity
Geology		
1. Possible leaks in pipeline and storage reservoir lining due to ground shaking.	All facilities designed to withstand ground shaking equivalent to 6.5 earthquake	LVMWD
Health Considerations		
2. Possible pathogens in aerosols from spray irrigation.	Spray irrigation should be kept at an adequate distance from human activities (buffer zone). Monitoring should be maintained to enable option of shifting to other irrigation areas if potential for human exposure exists, as per discharge requirements of RWQCB.	LVMWD and Regional Water Quality Control Board.
Energy		
3. Additional utilization of energy resources	Design of facilities should consider energy use reduction measures. Equipment should be sized and designed to maximize efficiency of operation and minimize wasteful energy consumption.	LVMWD and consulting engineers.

TABLE 58

MITIGATION MEASURES FOR OPERATIONAL IMPACTS
SOLIDS HANDLING

IMPACT	MITIGATION MEASURE	RESPONSIBLE ENTITY
Air Quality		
1. Odor emanating from sludge farm during wet weather	Trucking of sludge to Calabasas Landfill during periods of wet weather.	LVMWD
Hydrologic & Water Quality		
2. Possible effects of runoff or leachate from sludge farm operations	Monitor sludge farm to determine if runoff or leachate is contained on the site. Any runoff or leachate should be collected in control ditches and prevented from entering local surface water drainage ways.	LVMWD, and Regional Water Quality Control Board.
3. Possible on-site runoff from sludge farm operation	Runoff from surrounding hills should be diverted from the site by use of lined trench or culvert around the base of the hills. Precipitation falling on the disposal area should be contained by means of such measures as dikes, lined trenches, or evaporation ponds.	LVMWD, Regional Water Quality Control Board.
4. Degradation of groundwater quality	Observation wells or another monitoring system should be set up to insure applicable water quality standards are met.	LVMWD/Regional Water Quality Control Board.

Pathogens & Heavy Metals		
5. Possible contamination of surface and groundwater by heavy metals, pathogens	Establishment of monitoring program prior to sludge farm operation. Use baseline data for comparison as monitoring program continues throughout operation.	LVMWD and State Department of Health.
Biota		
6. Possible establishment of obnoxious weed species adjacent to disposal areas	Consider use of non-toxic herbicides to control populations of weed species adjacent to disposal sites.	LVMWD
Visual		
7. Visual impact of storage tanks from Las Virgenes Road and potential trail in Malibu Creek State Park	Careful site planning and placement of vegetative screening around storage tanks.	LVMWD and Construction Contractor.
Archaeological		
8. Disruption of archaeological site LAn-730 by sludge farming operation	Archaeological site LAn-730 would not be utilized for sludge farming operation. Purchase of land by LVMWD would insure protection of site.	LVMWD and archaeological specialist

In many cases, agencies would have joint responsibilities and interests with LVMWD-TCSD in addressing these mitigation measures. These agencies would include:

California State Water Resources Control Board
Regional Water Quality Control Board
California State Department of Parks and Recreation
California State Department of Fish and Game
California State Department of Health
Los Angeles County Flood Control District

7.4 SECONDARY IMPACTS (CONSTRUCTION AND OPERATION) AND MITIGATION

The secondary impacts described here are those which are listed in Chapter 5.0, Secondary Impacts, and which are generally applicable to the entire Study Area, although variations in intensity, timing and location could occur in the distinct subareas of the Study Area based upon the actions of the agencies responsible for mitigation measures, coordination and implementation.

In several instances, mitigation measures are not within the authority of, or are otherwise beyond, the control of LVMWD-TCSD. The great numbers of special or single function agencies involved in the Study Area and current ongoing studies and planning within the area tend to create a complex governmental network of divided responsibilities according to both function and geographic jurisdictional boundaries.

The mitigation of secondary impacts is not under the responsibility or control of LVMWD-TCSD, but the consideration of mitigation measures to deal with secondary impacts would involve LVMWD-TCSD coordination with the appropriate agencies which have the power to develop and implement such measures.

The AWFP efforts are directed toward insuring that future sewage treatment improvements be balanced with the planning of growth (by other agencies) and traffic related to secondary air quality impacts, land use planning objectives, and improvements/control of other growth inducing/serving utilities and infrastructure systems, to the greatest extent possible. This would be accomplished through more detailed coordination with ongoing parallel planning efforts and the designation of a "lead agency" cordinator responsible for overall coordination of the various efforts/jurisdictions involved.

TABLE 59

MITIGATION MEASURES FOR SECONDARY IMPACTS

IMPACT	MITIGATION MEASURES	RESPONSIBLE ENTITY
1. Accommodation of population growth (37,900 over current population levels).	Limit expansion of wastewater treatment facilities with coordinated additional limits to other public services and urban development.	LVMWD, L.A. County Board of Supervisors, L.A. County Regional Planning Commission, Ventura County Board of Supervisors, Ventura County Planning Commission, Ventura County Environmental Resources Agency, other governmental agencies providing services to the Study Area.
2. Expansion of urban development in undeveloped areas.	Limit availability of publicly developed wastewater collection and treatment facilities in undeveloped areas (additional trunk lines, treatment plants with greater capacities than existing demands, etc.). This measure can only be effective with coordinated limits in other public services and planning controls on urban development.	Same as number 1 above.
3. Increase in land value initiating further urban growth and attendant environmental problems in undeveloped areas.	Limit availability of publicly developed wastewater collection and treatment facilities to only those areas where service is currently being provided or where a specificially identified need exists. An increase in	Same as number 1 above.

		land values could also result from development of other public services, access, additional urban growth, etc. If it is desirable to limit increases in land value of undeveloped areas, it would also be necessary to limit additional public services, access and urban growth in undeveloped areas if any limit on wastewater treatment facilities were considered.	
4.	Increased demand on public services (transporation roads, schools, park facilities, etc.) as a result of induced population growth.	Coordinate public service and urban growth planning of all agencies within study area irrespective of geographic jurisdictional boundaries (i.e. Ventura County/Los Angeles County boundary) in order to facilitate necessary interrelationships, actions.	Southern California Assocation of Governments (SCAG), L. A. County Board of Supervisors, L. A. County Regional Planning Commission, L. A. County Regional Planning Department, Ventura County Board of Supervisors, Ventura County Planning Commission, Ventura Environmental Resources Agency, all other governmental agencies providing services to the Study Area.
5.	Increase in noise levels due to induced urban development and increased useage of public facilities (parks, transportation facilities, etc.).	Limit intensity and timing of useage of public facilities, provide attenuation buffers along noise sensitive areas,	All agencies operating, maintaining and providing public use facilities including:

		(schools, rest homes, residential areas, etc.), establish noise level controls over noise sources.	California Department of Parks and Recreation, California Department of Transportation, Southern California Rapid Transit District, Los Angeles County Department of Parks, Los Angeles County Department of Roads, Ventura County Public Works Agency, All governmental agencies with authority to regulate noise source levels such as: PEA, Los Angeles County Board of Supervisors, Ventura County Board of Supervisors, Los Angeles County Department of Building and Safety, Ventura County Environmental Resources Agency, etc.
6.	Emission of air pollutants from additional mobile and stationary sources induced by additional population growth	Reduce Vehicle Miles Traveled (VMT) by: a. Encouraging development of local employment, shopping, recreation, or social activities to lessen the need for existing extensive automobile travel to meet these requirements. b. Contain urban development to areas near existing transportation facilities (highways, transit stops) and encourage new highway development toward existing areas with high transit service potential.	California Air Resources Board, Southern California Air Quality Maintenance District, Southern California Rapid Transit District, California Department of Transportation, Los Angeles and Ventura County Planning Commissions, Los Angeles County Regional Planning Department, Ventura County Environmental Resource Agency, Los Angeles County Department of Parks, Ventura County Public Works Agency.

		land values could also result from development of other public services, access, additional urban growth, etc. If it is desirable to limit increases in land value of undeveloped areas, it would also be necessary to limit additional public services, access and urban growth in undeveloped areas if any limit on wastewater treatment facilities were considered.	
4.	Increased demand on public services (transporation roads, schools, park facilities, etc.) as a result of induced population growth.	Coordinate public service and urban growth planning of all agencies within study area irrespective of geographic jurisdictional boundaries (i.e. Ventura County/Los Angeles County boundary) in order to facilitate necessary interrelationships, actions.	Southern California Assocation of Governments (SCAG), L. A. County Board of Supervisors, L. A. County Regional Planning Commission, L. A. County Regional Planning Department, Ventura County Board of Supervisors, Ventura County Planning Commission, Ventura Environmental Resources Agency, all other governmental agencies providing services to the Study Area.
5.	Increase in noise levels due to induced urban development and increased useage of public facilities (parks, transportation facilities, etc.).	Limit intensity and timing of useage of public facilities, provide attenuation buffers along noise sensitive areas,	All agencies operating, maintaining and providing public use facilities including:

	(schools, rest homes, residential areas, etc.), establish noise level controls over noise sources.	California Department of Parks and Recreation, California Department of Transportation, Southern California Rapid Transit District, Los Angeles County Department of Parks, Los Angeles County Department of Roads, Ventura County Public Works Agency, All governmental agencies with authority to regulate noise source levels such as: PEA, Los Angeles County Board of Supervisors, Ventura County Board of Supervisors, Los Angeles County Department of Building and Safety, Ventura County Environmental Resources Agency, etc.
6. Emission of air pollutants from additional mobile and stationary sources induced by additional population growth	Reduce Vehicle Miles Traveled (VMT) by: a. Encouraging development of local employment, shopping, recreation, or social activities to lessen the need for existing extensive automobile travel to meet these requirements. b. Contain urban development to areas near existing transportation facilities (highways, transit stops) and encourage new highway development toward existing areas with high transit service potential.	California Air Resources Board, Southern California Air Quality Maintenance District, Southern California Rapid Transit District, California Department of Transportation, Los Angeles and Ventura County Planning Commissions, Los Angeles County Regional Planning Department, Ventura County Environmental Resource Agency, Los Angeles County Department of Parks, Ventura County Public Works Agency.

c. Improve public transit system to facilitate its use for commuters within the Study Area to outside employment areas and enable recreation seekers from outside the Study Area to be transported to local beaches and park areas (Park & Ride facilities, exclusive bus lanes, subscription services, etc.).

d. Creating disincentives for automobile useage such as control or managing or parking supply, reduction of parking supply, limiting useage of roads during peak hours, conversion of some existing traffic lanes to exclusive bus and/or car pool use, etc.

e. Encouraging use of car pools by providing matching service, employer participation, preferential lane and parking use, etc.

f. Encourage use of bicycles by development of bikeway transportation networks connecting residential, shopping, employment and recreational areas to reduce short trip automobile useage.

Reduce or limit stationary source emissions by:

	a. Requiring vapor recovery devices at points of fuel/gasoline transfer (gas station pumps, tank truck to filling station).	
	b. Limit use of organic solvents. Encourage use of less reactive (water-based) paints and solvents.	
7. Consumption of energy resources by additional population growth.	New urban development should be encouraged to utilize energy conservation methods, such as proper insulation, orientation and design of structures for highest energy efficiency, utilization of equipment and appliances, etc. Encourage use of solar energy for all new urban development. Encourage use of heat recovery systems.	Los Angeles and Ventura County Board of Supervisors, Los Angeles and Ventura County Planning Commissions, Los Angeles County Department of Building and Safety, Ventura County Public Works Agency, California Energy Resources Conservation and Development Commission, California Department of Housing and Community Development.

Discussions will be held with the appropriate agencies as studies progress. The following are several agencies, among others, that will require involvement:

California State Air Resources Board
California State Water Quality Control Board
California State Department of Parks and Recreation
California State Department of Transportation (Caltrans)
California State Coastal Zone Commission
Southern California Association of Governments (SCAG)
Southern California Air Pollution Control District (SCAPCD)
Southern California Rapid Transit District
County of Los Angeles (various departments including Regional Planning Department, Parks and Recreation, Beaches, Local Agency Formation Commission, Road Department, etc.)
County of Ventura (various departments similar to Los Angeles County)

7.5 STATUS OF MITIGATION COMMITMENTS

Although funds from the Clean Water Grant Program would allow the Tapia WRF to expand its capacity to 8 mgd, there are certain circumstances particular to this area that have caused EPA and the SWRCB to place conditions on LVMWD's receipt of Clean Water Grant funds.

As stated in Chapter 2, the LVMWD service area lies in the South Coast Air Basin. This air basin has been classified as a critical air basin since it is not expected to attain 1985 Ambient Air Quality Standards.

E-O growth projections are used by EPA and the SWRCB for planning sewage treatment facilities in critical air basins. These agencies utilize the 10 year E-0 growth rate projection as the fundable basis for any sewerage projects in the basin.

Expanding the Tapia WRF to accommodate an 8 mgd flow (approximately 76,300 to 80,000 persons) could possibly allow population increases to occur above the 10 year E-0 growth rate projection. (It should be noted that population increases above the 10 year E-0 growth could also occur in this area if private sewage treatment and disposal systems were able to be utilized.)

As the 8 mgd capacity could accommodate populations above the 10 year E-O projections for the area, EPA has requested that, prior to release of this Final EIS, a mitigation program be adopted to mitigate the secondary impacts to air quality.

As a result of this request, LVMWD/TCSD has contacted the State Air Resources Board, (which is the lead agency along with the Southern California Air Quality Maintenance District), involved in preparation of the Air Quality Maintenance Plan (AQMP). LVMWD/TCSD has also had discussions with representatives of other agencies empowered to enact and implement air quality impact mitigation measures. These include:

- County of Los Angeles, Department of Regional Planning
- Ventura County Air Pollution Control District
- Ventura County Environmental Resources Agency
- Ventura County Environmental Services Department
- Ventura County Department of Public Works
- City of Hidden Hills

These discussions have resulted in adoption of resolutions from the Boards of Directors of both LVMWD and TCSD, as well as, resolutions from the Ventura County Board of Supervisors and the City Council of the City of Hidden Hills. These resolutions commit these agencies and governmental bodies to participate and implement the AQMP. (See Appendix J.) The State Water Resources Control Board (SWRCB) requires that local agencies adopt resolutions committing them to participation and implementation of the AQMP. At the present time, the planning of the AQMP is in preliminary stages and a Regional Air Quality Plan dealing with alternative transportation and land use is expected in August of 1978. Evaluation and adoption of a plan would then proceed at that time. Since this planning is in formative stages, specific mitigation measures have not been developed to a point that can be adopted and implemented. The SWRCB will however, place a flow limit on the capacity of the Tapia WRF at the 10 year E-O growth rate or until such time as the AQMP is approved and adopted.

EPA, in order to comply with the National Environmental Policy Act, has also required that additional mitigation be secured before the project capacity is utilized.

The full utilization of the Tapia WRF capacity resulting from implementation of the solids handling elements of the proposed action is constrained by two factors:

1. The solids handling project will not be completed and in operation for an estimated 3 years.
2. A means of disposing the greater quantities of effluent has not been determined. Any proposed solution to this issue is subject to a draft Addendum EIS and subsequent Final EIS, as required and announced in the EPA notice of May 13, 1977 (see Appendix D).

However, in order to alleviate the current solids handling deficiencies and to promote reclamation of the effluent, EPA may release construction grant funds for the preferred projects described in this EIS subject to the acceptance by LVMWD/TCSD of the following grant conditions:

1. LVMWD/TCSD shall continue working with those local agencies responsible for implemention of air quality mitigation measures to develop a program to alleviate the adverse secondary air quality impacts generated by the population accommodated by the increased capacity of the Tapia WRF.
2. The above mentioned program must be approved by EPA and appropriate state and local agencies prior to release of a Final EIS for an effluent disposal project to handle the full 8 mgd capacity of the Tapia WRF.
3. Quarterly reports must be submitted by LVMWD/TCSD to the EPA detailing the progress of the steps required in condition 1 above. If it is determined that a good faith effort is not occurring on the part of LVMWD/TCSD, further grant payments by EPA for the projects described in this Final EIS will be subject to suspension.

8.0 Unavoidable Adverse Impacts

8.0 UNAVOIDABLE ADVERSE IMPACTS

8.1 INTRODUCTION

Because of the inherent difficulties associated with attempting to determine impacts, at other than a specific design level, it is neither appropriate or always possible to develop a specific listing of unavoidable adverse impacts.

Nevertheless, both general short-term and long-term unavoidable adverse impacts associated with the proposed Calabasas Reclaimed Water Line, and the sludge disposal alternatives (construction and operation), as well as some impacts that would be somewhat more specific, are described in a level of detail corresponding to the projects as currently proposed. It is advisable to note that no one alternative is totally free of adverse impacts. This includes the "no-action" alternative as described in Chapter 6.

8.2 SHORT-TERM/CONSTRUCTION RELATED ADVERSE IMPACTS

In general, the short-term unavoidable adverse impacts are those which are associated with the process of constructing the components of the proposed facility, and are transitory (lasting only during the construction process), and generally capable of mitigation through careful planning and control of the construction process itself, machinery utilized, timing of construction activities, and pre and post-construction site preparation and restoration. Most projects of this type and their related construction processes, have, through past experience, developed extensive methodologies and checks and balances for insuring that disruption is minimized for both human activities and the environment. Careful timing of construction activities to avoid peak traffic hours, night hours in residential areas, and peak useage hours at special facilities as well as use of newer sound-proofed equipment, dust control/erosion/runoff mitigation measures, enable maintenance of necessary environmental quality standards, particularly if responsibility for maintaining such control is made a part of the construction contractor's legal requirements, specific standards and protection areas/methods are described, and periodic enforcement insured by government agencies and the construction administrator.

Typically, the generalized transitory construction impacts which would be common to both Calabasas Reclaimed Water Line and sludge alternatives are the following:

1. Disruption of soils and slopes, drainage patterns, some possible erosion related to any excavation, trenching, drilling or blasting work.

2. Compaction of soils due to presence of men, equipment, temporary or permanent access roads, other construction activity affecting permeability, drainage, vegetation etc. (equipment/materials storage).

3. Removal or root disruption of oak trees and other vegetation through soil compaction and/or clearance for construction activity, possibly increasing erosion, sedimentation potentials in runoff conditions, removing small animal habitats, etc. (primarily groundcover, weedy species)

4. Creation of dust as result of all three preceding activities (also subject to wind).

5. Creation of noise and sound impacts as result of operation of construction equipment, any blasting activities, with particular sensitivity of residential areas. (Can be scheduled and otherwise mitigated.)

6. Disruption of traffic flow on any surface streets crossed by, or closely paralleled by pipeline construction activities. (Transitory in time and location.)

7. Increased turbidity, for short periods, of water bodies such as creeks, resulting from possible construction activities, runoff sedimentation, etc.

8. Pipeline construction of both projects could have adverse impacts on two separate archaeologic sites as a result of trenching. However, mitigation measures could be taken to preserve or insure the proper excavation of any remains found.

9. Visual "clutter" resulting from usual chaotic appearance of construction sites, activities accompanied by some possible disorientation of detours, temporary closures of streets, other access changes. (transitory)

10. Some disruption in pre and post-construction periods due to set-up and restoration/clean-up activities.

Since most of the linear type of construction impact will result from the pipeline laying activity associated with the reclaimed water line and the sludge pipeline, the impact will occur adjacent to existing pipelines or utility corridors or along streets and highways, and thus, would be limited primarily to these corridors. Both Las Virgenes Canyon Road and Mulholland Highway are, or can be, developed to be capable of handling both construction activities/impacts and their primary transportation function without severe environmental impact. Pipeline construction elements crossing open land and requiring excavation or deep trenching will also result in impacts, although none of these is expected to represent a permanent disruption of the use or appearance of the land.

Site-related construction impacts would be present at any new pumping stations, tank and reservoir construction, and any construction involved in increasing capacity within the existing Tapia WRF site. The site area disruption resulting from the construction of the sludge holding tanks will be removed from residential areas and major traffic routes, however, construction activity will be visible from either Mulholland Highway (Ross property) or Las Virgenes Canyon Road (Sampo-Hope Ranch).

The impact of site-area type of construction of the pumping facility will be quite limited, due to the small size of such facility and in many cases would represent "expansion" at or near the Tapia WRF. The impact of construction on the Tapia WRF site would be negligible, since it has been planned with expansion in mind and can easily accommodate all such activities.

The timing and duration of construction is, of course, a function of the alternative selected for construction, its design characteristics, and the scheduling of construction activities. For instance, if the Calabasas alternative were chosen for sludge disposal, construction time would be the least of any alternative since the only change from the current operation would be to add solids handling and dewatering units at the Tapia WRF. Construction periods for various major elements of the reclaimed water line and the sludge disposal system could range from 6 to 21 months, according to preliminary estimates by the consulting engineer. It must be borne in mind that construction activities of linear facilities, such as pipelines, will proceed along the intended route, rather than concentrating in one location as with the site-specific type of construction, and will thus be less impacting over time and at single locations. Typically, such efforts will proceed at 100 feet/day or more, depending upon terrain, soils, geology, complexity, and other factors.

Past experience has indicated that the transitory nature of pipeline construction impacts extends to the natural environment "rebound" considerations as well, since, even in cases where temporary disruption of the terrestial habitat has occurred, a return to the original character of environmental structures and quality is generally accomplished within the ensuing year after construction. This, of course, is not the case with any construction-related removal of mature specimen trees, complete obliteration of types of vegetation and related wildlife habitats, or major alteration of the terrain features, although good planning and project management can avoid these major irretrievable impacts, or mitigate their effects.

8.3 LONG-TERM/OPERATION RELATED ADVERSE IMPACTS

As with the short-term impacts, these longer-term impacts vary with the alternatives considered, and are basically a function of the technical operational characteristics of the system utilized and the management of its operations. Some of the unavoidable adverse impacts associated with system operations of the alternatives are relatively transitory in that they would actually involve random episodic events during the overall operational life of the system (such as a plant upset), rather than a continuing adverse effect related to "normal" system operations (consumption of energy).

Again, like the short-term unavoidable impacts, experience has developed means of mitigating such longer-term effects, and the development of new technologies, processes, and regulations could also affect them significantly. Additionally, careful continuous monitoring of operations can result in reduction of impacts and improvements in efficiency through anticipatory actions and development of performance data, enabling such efforts as energy conservation through use of automatic controls.

The long-term/operations-related adverse impacts are somewhat more unique to some alternatives, but several types of impact would be common to most:

1. The consumption of increased amounts of electricity and diesel fuel (over current levels) and continuing use of various types of energy, as with most utilities (until more efficient energy sources and conversion processes are developed), involving fossil fuel resources.

2. The commitment of various amounts of land (depending upon alternative) to use in pipeline easements and sludge farming, although this does not preclude the use of the land for other purposes (agriculture, recreation). However, it does, in the case of land purchased for sludge farming, represent a loss to the tax rolls. (A possible revenue source is available from the sale of crops grown at the Sampo-Hope Ranch.)

3. Potential visual disruption of a rural area due to the amount and bulk of the sludge holding tanks, and by establishment of diversion channels necessary to redirect off-site waters to the creek.

4. Continual disruption, nutrients, and water in the sludge injection areas could give rise to obnoxious weeds.

5. Possible loss of an archaeologic site in the Sampo-Hope property if site area is farmed. Soil chemistry will be altered by sludge farming which will affect faunal and human remains.

6. The occurrence of an earthquake causing strong ground shaking in the project area is unavoidable. Although not exactly predictable in time, an earthquake will occur in the Southern California region, and if strong and close enough, its shaking could rupture the pipeline and damage the storage tanks. Surface runoff would occur as a result of such a rupture with both projects and could erode soils and enter surface waters if not checked or repaired promptly.

7. Additional air pollutants would occur with the use of diesel fueled sludge injection trucks.

8.4 INDIRECT ADVERSE IMPACTS

The indirect adverse impacts of any alternative are those described in Chapter 5.0 which result from either anticipatory induced growth or unrestricted growth without benefit of comprehensive land use and infrastructure planning (transportation, utilities, services). Barring development controls and actions by other agencies (Los Angeles County Planning Department, Ventura County Planning Department) growth would occur in significant portions of the LVMWD/TCSD districts with or without the expansion of sludge handling facilities at the Tapia WRF. This could occur since other private sewage treatment and disposal systems could be set up over which the LVMWD/TCSD districts would have no control. Therefore, the indirect adverse impacts associated with growth are not totally a result of sewering facilites and, as such, cannot be fully attributed to an expansion of Tapia's facilities. However, if the plant is expanded to 8 mgd capacity, the possibility for certain actions, or reactions occurs. These are:

- Land use changes which will occur as planned and future housing developments which will urbanize previously open areas or agricultural lands.

- Increased traffic congestion with increased population, and the probability that the highway capacities will be exceeded.

- A continued aggravation of the air quality problem of the South Coast Air Basin even with anticipated emission reductions.

- A demand from the future populations for more public services (roads, parks, schools, etc.)

- Disturbance, or potential loss of natural areas due to development.

9.0 RELATIONSHIP BETWEEN SHORT-TERM USES OF THE ENVIRONMENT AND MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

9.1 INTRODUCTION

Construction of the preferred alternatives of the proposed elements to the AWFP will satisfy the short-term needs (20 years) of the Tapia plant; allow the LVMWD and TCSD districts to adequately comply with disposal and reuse of reclaimed water and sludge; assure the continued use of reclaimed water and sludge which will be able to accommodate the projected population in the districts; and allow for continued planning efforts to be accomplished on a region wide basis under the auspices of the Area Wide Facilities Plan. In effect, it is part of an effort to establish a comprehensive view of what are necessary actions in the short-term, to insure that man's natural waste products, both current and projected, within the Study Area, are dealt with in such a manner that they do not preclude the long term use of the Study Area and its surroundings for habitation, agriculture, recreation, and other purposes.

9.2 SHORT-TERM USES/ACTIVITIES - LONG TERM EFFECTS

- The short-term use of Sampo-Hope Ranch for sludge and crop farming will keep that land (560 acres) as open space for the duration of the LVMWD ownership. The long-term effects could be a result of soil depletion in the injection areas and the chemical changes that will occur in the localized site as a result of the presence of sludge.
- An increase in housing units will occur in the Study Area which could decrease the amount of open space or agricultural lands in the long term.
- An increase in automobile useage and vehicle miles traveled within the Study Area and beyond, if present travel patterns persist.
- A long-term effect, as a result of the two above factors, in air quality with additional VMT and resultant emissions which, unless controlled in the future, could prevent attainment of ambient air quality standards.

- An increase in energy consumption which could contribute to a decrease of natural resources.

- Short-term use of reclaimed water for the Calabasas Golf Course and other areas could improve the long-term demands of the study area with regard to the use of imported fresh water and energy consumption required to pump the fresh water.

- The provisions of disposal areas for use of reclaimed water and sludge will result in long-term sewage disposal sites. Utilizing these sites will result in the adequate and beneficial reuse of the effluent per the design capacity of the plant.

- Short-term capital expenditure for the pipelines and land purchase can result in long-term provision of disposal sites for reclaimed water and sludge.

9.3 SHORT-TERM AND LONG-TERM BENEFITS AND BENEFITTED GROUPS

- Initially, the first benefitted group is the LVMWD/TCSD customers who can rely on adequate technology to beneficially dispose of their wastes.

- Landowners and developers will benefit by having a clearer understanding of what will be available in terms of wastewater treatment facilities and reclaimed water availability and the policies, timing, and capacities associated with these projects. This will permit these entities to proceed with plans that can be paced to the availability of these facilities.

- Governing bodies will benefit by knowing the plant capacity and disposal constraints upon which they can base planning decisions.

- The citizenry of the Study Area will benefit as a result of using reclaimed water and sludge for irrigation and farming operations by decreasing the amount of imported water for the golf course and adjoining orchard, and preserving the Sampo-Hope property as an open space and farming area.

10.0 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

10.1 INTRODUCTION

It should be noted that any activity related to man's use of the environment for any purpose, including habitation, involves the irreversible and irretrievable commitment of resources, and it is the degree and type of resources involved which is properly the focus of this type of analysis. Thus, even the "no action" alternative will result in impacts to the following resource categories due to the fact that ongoing and potential activities from other growth factors will continue even if no action is taken on these elements of the AWFP. Mitigation measures can be taken in advance of any action on even the most environmentally suitable alternative which will insure that it is implemented (and subsequently operated) with the lowest impact on such resources. Monitoring the project prior to and during operation can result in modifications and improvements to operating procedures to insure that new technologies and processes which are less impacting to resources are utilized. Additionally, comprehensive planning activities of other jurisdictions and agencies involving the expenditure of resources can be coordinated so that all such activities result in plans and controls which will insure the most efficient use of resources.

10.2 RESOURCE COMMITMENTS

The major categories of resource commitments are: land, water, cultural-biological resources, monetary resources, energy and materials.

Land committed for the construction and operation of the two elements of the AWFP involves linear strips of land for pipeline construction (within existing road or utility easements), and the use of 126 acres of land for sludge farming. However, the use of these lands is reversible and retrievable since they are utilized for activities that are not irretrievably committed to one definite use. Additionally, lands utilized for reclaimed water disposal and sludge disposal result in the beneficial use of a man-made resource.

Less imported fresh water will be committed to the study area since reclaimed water can be substituted for fresh water and used for spray irrigation of the Calabasas Golf Course, Calabasas Orchards, and other potential uses.

The possibility does exist for the construction and operation of the pipelines (Calabasas and Sampo) and sludge farming to irreversibly alter the character of archaeological sites along the route and within the farm area. The known sites can be protected, and mitigation measures can be implemented to either preserve or lessen the construction and operational impacts of the projects.

Biological resources within the construction zone will be impacted and, if proper avoidance or mitigation measures are not implemented, a number of fully grown oak trees could be irretreivably lost. Other impacts to biological resources are short-term and are not irreversible since the vegatative and animal communities will return to disturbed areas once man and machines have left.

The commitment of monetary resources represents both an irretrievable and irreversible commitment of resources in the short-term with a long-term recovery (planning, design and capital costs) and a continuing long-term irreversible and irretrievable commitment for operating costs which is also "recoverable" assuming revenues meet costs.

Preliminary costs for the preferred alternatives prepared by the engineering consultant include: a total construction cost for the Calabasas Reclaimed Water Line of $856,898 and total annual costs (amortized over a 20 year period) for construction and operation of the Sampo-Hope Ranch at $461,830.

Energy resources in the form of electrical consumption, gas, oil and diesel fuel consumption would be expended by any alternative including a "no action" alternative. The consumptive use of any energy source is an irreversible commitment of a natural resource that, in turn, contributes to man's technological life-style. The pump stations needed to pump reclaimed water to Calabasas will utilize enough electrical energy in one year to heat and light approximately 252 residential units. The equipment necessary to operate the sludge farm at Sampo-Hope Ranch will consume energy equivalent to the electrical energy utilized by approximately 165 residential units in one year.

As with any public works project, raw materials and energy are utilized in the construction period. Materials associated with the Calabasas Reclaimed Water Line include:

- Piping of various sizes as well as all related connectors, fittings, etc.

- Pumps, filters and other mechanical items.
- Concrete and structural steel used in construction of new facilities at the plant.
- Construction support materials, including shoring, safety materials, machinery, etc.

The above materials would also be needed in construction of the sludge pipeline to Sampo-Hope Ranch. Additional materials, particular to this project are:

- Construction materials needed for the construction of storage and aeration tanks.
- Materials utilized in manufacturing the sludge injection truck as well as tractors or other mechanical implements for crop cultivation.